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### 08 Laptops For Students

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# BEST LAPTOPS FOR STUDENTS

**James Hunt** looks for the best value in a crowded marketplace

**T**he end of the summer holidays can be a depressing time for anyone returning to education – but it's also a great opportunity for you to treat yourself to some new hardware. Whether you've got a student loan to burn through, some summer cash saved up, or someone who wants to give you the best start to the educational year, a new laptop is a great investment. If you're in the market for a new system, our guide to the best student laptops will help you choose one.

## What To Look For

The important thing to remember is that you're never looking for 'the best' device – only 'the best device for you'. Low-end laptops and Chromebooks are aimed at light users who might have a tablet or smartphone they use more frequently than anything else, while Ultrabooks are ideal for those who are never apart from their laptop. You don't have to spend a lot of money to get something that'll work for you!

With that in mind, we've tried to present a spread of devices that go from the cheapest to just under £1,000, on the basis that there's almost certainly no reason to spend more than that on a laptop that isn't being used for eight hours a day! It's also worth remembering that if you wait until you're actually a student – or you can show proof you attend a university or educational organisation – there's a chance you can get discounts off the stated prices.

Finally, remember that you can customise most of these devices to within an inch of your preferred pricing. Unlike tablets, whose specs are more or less fixed, laptops can be improved and expanded before you

spend a single penny. These prices are all for the most basic configuration offered pre-built, and if you want to save money – or beef your computer up a little more – you can always make a few changes here and there.

## HP Stream 11 (£149+)

The problem with budget laptops is that they often throw out Windows to keep the price down, which is fine if you're okay with a different operating system but not so much if you want something familiar, widely supported and guaranteed compatible with any proprietary software your university might want you to use. This makes the HP Stream 11, the king of low-priced options.

Cheap and cheerful is this laptop's *modus operandi*, and that's reflected in the bright plastic colours of the case. It's still slim, though, and while the 11.6" 1366 x 768 display isn't the best around it's not underperforming in any great sense. It's got a webcam built in, and some surprisingly good speakers, not to mention an Intel Celeron CPU and 2GB of RAM. It has the same MMC storage as HP's Chromebook (32GB by default) and softens that slightly with a free two-year subscription to OneDrive, giving you 100GB free.

The small size and low-demand interiors mean it can chug along happily for an impressive 8+ hours without cramming in a huge battery.

HP Stream 11







HP Chromebook 14

Connectivity includes a USB 3.0 port, an HDMI port, and microSD slot. The 11" version has one extra USB 2.0 port too, but if you opt for the larger HP Stream 13 you get a second thrown into the bargain.

We mainly recommend this to people who perhaps have a tablet they use as their main device and just want something that runs Windows close at hand, or alternatively incredibly light users. As a budget device, it's eclipsed by all sorts of tablets for almost any practical purpose so while it's the best in its sub-£200 class, think hard about whether you need a device like this at all.

### **HP Chromebook 14 (£289+)**

Also a new product from Q1 this year, the latest HP Chromebook is aimed at people who want a cheaper, lower-end system that's maybe not going to be used as a multimedia device – something for a bit of writing, web-browsing and emailing perhaps. Core specs include a 6th Generation Intel Celeron CPU, 2-4GB of RAM, a 14" screen with 1366 x 768 resolution and either 16- or 32GB of storage in the form of an eMMC card.

Of course, it doesn't run Windows – it runs Chrome OS,

which is mostly designed for accessing the Internet. You do get the functionality of Google's web apps free, which compensates for the inability to use software like Microsoft Office, but it's not a laptop for anyone who's less than confident learning and managing a new operating system and accompanying applications.

Despite its relatively low cost, the screen, trackpad and keyboard are all fine. It's about 18mm thick and weighs 1.7kg, however, so it's not the lightest system around – though part of that is because the screen is larger. Its port options feature an HDMI-out, a single USB 3.0 port, a headphone jack, and a microSD slot. There are also two further USB 2.0 ports, meaning you shouldn't lack connectivity. Bluetooth 4.0 is also included as standard, which is a handy feature that isn't available on all laptops.

Assuming you're prepared for the limited storage (it wants you to use the cloud more than local storage) the only bad thing about this device is the battery life, which claims to be eight hours but often scrapes in just under six. At this price, it's hard to complain too vehemently, especially because the price is the main thing – and that, at least, you cannot fault.

### **Asus Zenbook UX305 (£650+)**

This Ultrabook from Asus was refreshed at the start of the year, and is ideal for those who like the look of a MacBook Air but can't quite bring themselves to pay Apple's premium pricing. The specs are reasonable: You'll get at least a 6th Generation Intel Core m3 (Core m5 & m7 upgrades available), with at least 8GB of RAM, a 13.3" screen that can be chosen in either HD (1920 x 1080) or 3K HD (3200 x 1800), and SSD storage of either 256GB or 512GB.

Thinner than a MacBook, the Zenbook comes with Windows 10 and weighs only a shade over a kilogram. Its one-piece aluminium shell makes it sturdy yet lightweight, and its 12.3mm thinness makes it easy to slip into a rucksack or large handbag. It features no fewer than three USB 3.0 ports, which borders on excessive by the normal standards of such devices, and also has an SD card reader and micro HDMI. You also get a 2MP webcam built in.

Although it struggles with graphically-intensive tasks (it's not a gaming machine) it's at least as good as a MacBook in most other situations. The speakers are also a little weedy, but that's a common problem with thin laptops. Luckily

you can rely on the headphone jack if you want to listen to music or watch TV. Battery life is a more than decent six-to-eight hours depending on the type of use.

Clearly, at £650, it's not the greatest system on the market. However, for those who want a high-end feel without a high-end price, there's plenty to like. As Ultrabooks go, you won't find one more affordable and well-rounded than this.

### LeNovo IdeaPad Y700 (£729+)

Just because you're a student, it doesn't mean you aren't allowed to have fun – and if that's your priority, then the LeNovo IdeaPad Y700 is a laptop that will offer you the power you need to keep on gaming, even away from home.

Inside you'll find a 6th Generation Intel Core i5 (Core i7 optional) and a dedicated graphics card: Nvidia's GeForce GTX 960M, with either 2GB or 4GB of memory. RAM ranges from 8-16GB and the screen is a 15.6" full HD IPS display. Unusually, it comes with a 1TB hard drive rather than SSD in its cheapest configuration, but if you're a serious gamer then you'll probably want to swap it out for an SSD option purely to get the benefit of the extra performance.

In fact, if you remove the Hard Drive entirely and go for a 128GB SSD you can knock £15 off the price. Realistically, though, the 256GB SSD is a more practical option – but that only takes the price up to £775.

As a gaming laptop, it looks the part, though it doesn't have things like weight and profile to worry about because it's never going to be thin and lightweight. It has a backlit keyboard with built-in rubber wrist rests and an anti-glare display. Ports include a pair of USB 2.0, a pair of USB 3.0, HDMI, Ethernet and multi-card reader. It also has Bluetooth and a 720p webcam.

As a gaming laptop the battery life is necessarily curtailed. You can expect four hours out of it – though that's superior to the majority of devices in its class, which tend to fall somewhere in the three-hour bracket. At 2.6kg and a massive 43.18mm thick, it's not the type of system you'll be taking out and about – but if you're off to university it's certainly a lot easier than dragging a full-tower desktop around the UK.



Asus Zenbook UX305

LeNovo IdeaPad Y700



### Dell XPS 13 (£899+)

The Dell XPS 13 is an Ultrabook that's super-small and compact but doesn't cut corners on its specs to reach its goal of being ultra-portable. With a long

history of excellent performance in the field, the current model of the Dell XPS 13 is no stranger to greatness.

Indeed, it's so compact you could be forgiven for thinking it's an 11"





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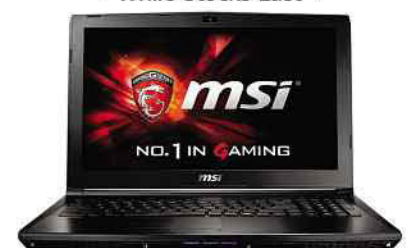
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model, but it's not. It has a 13" full HD 'InfinityEdge' screen, that is both super-bright and almost borderless, allowing for a tiny bezel that wastes no space on plastic. Inside you'll find a 6th generation Intel Core i5 processor, 4GB of RAM, and a 128GB SSD. Connectivity includes an SD card reader, two USB 3.0 ports, and two rarities: a USB-C port and a ThunderBolt port. You also get some nice touches like the light-up battery gauge on the side.

Its size does have drawbacks: the keyboard is squashed, even by Ultrabook standards, though its 15mm thickness means it's hard to be upset. It weighs just 1.2 kg, so portability is clearly what it's built for. If you're the sort of student who's planning spends more time working in cafes and study rooms than your own place, it's exactly the type of device you need.

The only place where it falters in any major way is the battery life, which clocks in at between four and five hours, probably due to the screen brightness. If you lower that, you can stretch it out to a comfortable five or six hours of basic use. It's hard not to compare it to the similar (and largely cheaper) Zenbook in this regard. Ultimately, it's not a dealbreaker – everything else about it is rock solid.

### 13.3" MacBook Pro with Retina Display (£999+)

If you want your laptop to impress others as well as you, Apple's 13.3" MacBook Pro is probably on your shortlist. Although you have to expect to pay big bucks for any Apple product, this balance of price and performance is the best of its range.

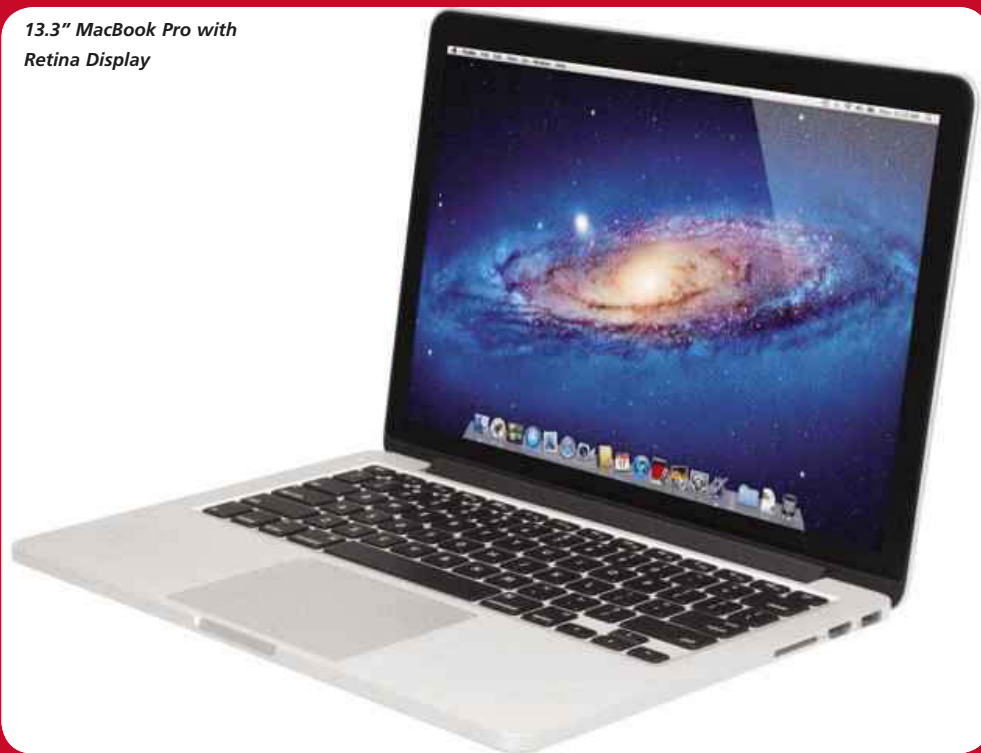
Specs include a 13.3" retina display (2560 x 1600), an Intel Core i5 (or Core i7), up to 16GB of memory and up to 1TB of flash storage. The battery is what really makes it, though – 10 hours of browsing or 12 hours of HD video.

You also get a few Apple touches – Bluetooth 4.0 as standard, the magnetic MagSafe power port, a pair of USB 3.0 ports, a pair of Thunderbolt ports, single HDMI port, and force touch trackpad. It also packs in an HD webcam and SDXC memory card slot. Software-wise it runs on OS X El Capitan and you get Apple's Office equivalents – Pages, Numbers and Keynote – for free, alongside things like GarageBand and iMovie for multimedia creations. For students with lots of time



*Dell XPS 13*

*13.3" MacBook Pro with Retina Display*



on their hands or creative energy to spare, it can't be beaten.

Although corners are cut in places, the version under a grand is still fairly competitive. It has the same CPU as the £1,199 version, and the same amount of RAM (8GB) but only 128GB

of flash storage, which accounts for the lower price. Let's face it, though, that's not a bad amount. While it might take a little extra management, you should be able to make it last a good year before you even need to think about a clean out. [mm](#)



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# BEST TABLETS FOR STUDENTS

Could one of these replace your laptop? Maybe...

**O**ver the past few years, tablets have gone from being an expensive luxury to a virtual necessity for any student trying to set themselves up with a versatile and compact device that can be used for work and leisure. Indeed, when paired with a Bluetooth keyboard, most modern tablets might even be able to replace a laptop entirely – as long as you've got a computer lab nearby for running the kind of ancient, Windows-only software packages universities like to throw at you.

Still, essential as they may be, picking a tablet can be difficult – and when you're buying one as a student, the things you have to consider may not be the same as if you were buying one more casually. To try and help you with your decision, we've looked at the some popular tablet and mini-tablet devices with an eye on whether a student would want them.

## Mini Tablets

If a device has a screen size around 8" or less, it counts as a mini-tablet. 7" devices have been around for a few years now and have become the most popular size for budget buyers, which gives everyone a lot of choice. The market for mini-tablets is also much wider than the market for full-size ones, partly because Apple's dominance doesn't extend all the way down to the lower end of the price range, because you get both super-cheap and luxury devices in the price category.

For students, the benefits of mini-tablets are considerable. Primarily, they're cheaper and more portable, but they're also more discreet and compact, and easier to deal with in the limited space of a lecture hall. The only real disadvantages are their low processing power, which could make them slow to work with, and the fact that the small screen makes them harder to work on even with a keyboard. Rather than buying a mini-tablet instead of a laptop, you're more likely to buy one alongside it.

## Amazon Fire Tablet

It's almost impossible to keep track the different iterations the Amazon Fire tablet has been through over the years, but at the moment there are five different versions: the Fire, the Fire Kids Edition, The Fire HD 6, the Fire HD 8, and the Fire HD 10. Of those, you get the best deal out of the simplest version: the Fire Tablet, which is a 7" device costing just £40 at present.

The reason for this is that it's getting on a bit, and is unashamedly low-spec – but in a market where the other super-cheap devices like the Nexus and Hudl have disappeared, you can't beat the Fire Tablet for value. Don't expect to be impressed by the numbers: the 7" screen has just a 1024 x 600 resolution, so it's not even full HD, and it only has 8GB of onboard storage (though you can add up to 128GB using a microSD card). The low-specs at least mean the battery life is pretty good,



Amazon Fire Tablet



at seven hours. There's a 2MP rear-facing camera and a front-facing VGA camera.

As tablets go, it's definitely not powerful enough to be your only device, and while Fire OS has become a lot more Android-like recently it's still missing things like Google's app selections. It's not the sort of tablet you can work on for extended periods either, because performance can be sluggish. As a leisure device it's passable, despite the lack of an HD screen, but if you've got a high-end smartphone you can probably get away with just that. The only reason to go for the Amazon Fire Tablet is the price; while that is amazing, if you can afford better there are definitely better options.

### iPad Mini 4

Just to keep matters confusing, Apple has two iPad Mini models. The cheaper of the pair, the iPad Mini 2, is priced at £219 for the 16GB wi-fi model, making it the cheapest iPad that Apple sells. It's now a couple of years old and has been superseded by this more powerful, more expensive, iPad Mini 4 – which starts at £319 for the 16GB model. Both have screens of 7.9", so they're a good size, but the iPad Mini 2 is getting on so it's hard to recommend.

At the same time, the iPad Mini 4 is almost certainly going to be refreshed within the next month or two, so if you buy one you'll pay a lot of money for a device at the end of its lifespan – but that's the game you play when you buy a tablet.

Still, it's well ahead of the rest of the field, to be honest. The retina display has a resolution of (2048 x 1536) and, in terms of appearance, is easily the best screen you'll find in a mini-tablet. The 64-bit Apple A8 CPU is surprisingly powerful too. Larger storage capacities are available up to 128GB, but are prohibitively expensive – £479 without 4G, £579 with. We'd check whether your provider offers tethering if we were you.

Still, the iPad Mini 4 isn't a bad investment for those who want a small tablet for practical rather than financial reasons – but if you want good value, it's hard to recommend. The mini-tablet form is mainly attractive because of its ability to offer significantly lower prices, and if you're not bothered about low prices then you can get an iPad Air 2 with equal capacity, similar capabilities, and a significantly larger screen for just £30 more.

Access to the astonishingly great iTunes U (a selection of free University-level lectures and textbooks) aside, the only reason you might want to go with an iPad Mini over any other mini-tablet is if you've already got an iPhone and want your apps and content to sync without any difficulty. If you think that's worth spending the extra money, fair enough. And if the screen size isn't great for working on, at least the software on Apple's ecosystem is second-to-none.

### Galaxy Tab S2 8

If the Amazon Fire's too cheap and the iPad's too Apple, then you do still have options: the Galaxy Tab S2 8 is £295, so it's not excessively cheap, but it can easily rival the iPad Mini 4 in every way that matters – in addition to being thinner and lighter it runs Android, so you can hang onto your preferred ecosystem.

The specs are great, with a 2048 x 1536 super AMOLED display. Its octa-core CPU and 3GB RAM means it benchmarks faster than the iPad Mini 4, and it's got similar connectivity: 802.11ac wi-fi, Bluetooth 4.1 and optional 4G. The cameras (2.1MP and 8MP) are good too. 32GB of basic storage can be augmented by up to 128GB with a microSD, as you'd expect and it comes with Android Lollipop but is Marshmallow-ready.

Students will enjoy its combination of high power and high portability, as that's exactly what you need from a mini-tablet. Although it's a smaller version of a 9.7" tablet, it isn't so slashed back that it barely rivals the



iPad Mini 4

average smartphone, so it actually works as a companion device no matter what you already own – but it's also just good enough to be your main work/entertainment device as well. A good all-rounder.

Essentially, if you're looking for a mini Android tablet and money isn't a concern, this is the one to go for. There are cheaper tablets out there, but none so portable or powerful. Samsung's name remains synonymous with high-quality hardware, and its tablets have been the best Android devices around for years now. This one is no exception.

### Full-size Tablets

Any tablet 9" or larger can be considered a 'full-size' device. Their dimensions, cost and greater performance capabilities tends to mean that these tablets are bought instead of, rather than in addition to a notebook PC, but it also means they're a lot less common than smaller tablets, which are made much cheaper by trading off screen real estate.

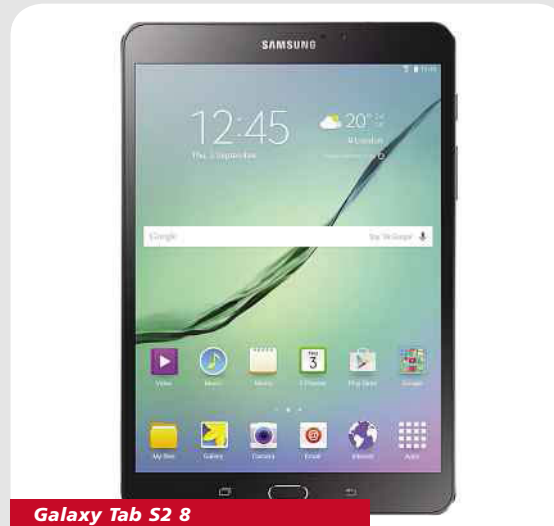
In an educational context, full-size tablets mostly prove themselves to be useful because you can do your work on them comfortably. Combine them with a Bluetooth keyboard and you essentially have a system that competes with a notebook in a fraction of the space, and with a lot more versatility.

### iPad Air 2

Although it's no longer Apple's flagship tablet model (the iPad Pro gets that accolade these days), the iPad Air is still a fantastic draw. If you're eager to get a tablet and you're already plugged into Apple's ecosystem through a Mac or an iPhone, this is undoubtedly the one you should be going for. Everyone else will have to make some hard decisions about whether it's worth the money, but in every way that matters it's currently the best tablet on the market.

Physically, there's little to complain about. The iPad Air 2 weighs just 437g and features a 9.7" screen, and at 6.1mm thick it's also one of the thinnest tablets around. Less than a quarter of the weight of an average laptop, it's hugely portable and, unlike earlier iPads, the iPad Air models can be comfortably held in one hand. That simple fact actually greatly improves their appeal – it feels like this is the tablet the first few models were working towards being.

Students will no doubt be pleased that they get free access to Apple's full office suite (Pages, Numbers, and Keynote), their multimedia apps (iMovie, Garageband and iPhoto), and their full library of lectures, notes and reference materials on iTunes U. In short:



Galaxy Tab S2 8



iPad Air 2

you get everything you need to make your tablet into the ultimate studying accessory – bar, that is, a keyboard.

The cheapest version of the iPad Air 2 has a standard 16GB of storage and wi-fi support only, priced at £349 in black/space grey, white/gold or white/silver colour combinations. It also comes in a 64GB variety, with or without 4G. The most expensive version of the iPad Air 2 (4G, 64GB) still costs just £449 which – considering its laptop-rivalling abilities – isn't bad at all.

The iPad Air 2 really comes into its own if you've got an iPhone or existing iPad that you can synchronise content with. It's expensive, but you're paying for quality as much as the name. The truth is that no full-size Android tablet can convincingly best Apple's efforts. The only thing that might put students off is the price, but when you can get this much use out of a device it'll practically pay for itself.



## Google Pixel C

Picking the best full-size Android tablet is hard, because this is an area where manufacturers have struggled, and largely failed, to beat anything offered up by Apple. Of the devices in this class, it's Google's Pixel C tablet which probably comes closest to rivalling the iPad Air 2. It's also the first designed and built by Google from the ground up, so that might explain it.

Priced at £399, it has 32GB of microSD-expandable storage, 3GB of RAM and a 10.2", 2,560 x 1,800 resolution screen that looks amazing. It comes with the latest version of Android, and a USB Type-C port for charging and data transfer purposes. There's also an option keyboard which, for an extra £119, turns it into a laptop-style device. Not quite a convertible, but pretty close.

It is a little heavier and thicker – 517g, to the iPad Air 2's 437g, and 7mm thick to the iPad Air's 6.1mm – but you also get an extra two hours of battery life, upping that to a total of 12. The only thing that hurts is its pricing: it costs £50 more than an iPad Air 2 and it's still not as smooth-running or portable. Plus, it's running Android, so you're always going to be treated like the second-class citizens of the tablet world by app developers, most of whom still prefer iOS.

If you're keen on Android and locked into it through your phone or some other device, you won't find anything close to being as good as the Pixel C. In a way that's damning – it seems like Android manufacturers aren't even trying – but it does at least make your choice and easy one.

## Surface Pro 4

To the surprise of many naysayers, we'd assert that the Surface Pro has carved out an unlikely niche for itself – and even managed to put Apple on the back foot. So, if you're trying to get your hands something that can rival any laptop for performance and compatibility you have to consider the latest version: the Surface Pro 4.

For students, the most immediate concern is money. Even the most conservative configuration – 128GB storage, Intel m3 CPU, and 4GB RAM – costs a fairly hefty £749. For that money you do get Windows 10, a 12" higher-than-HD display, Wireless AC, a full-size USB 3.0 port, a Mini DisplayPort socket and a microSD card reader, so in hardware terms it is undeniably competing with a pretty good laptop – but its price reflects that.

The problem with Microsoft's bold claim that this is a laptop-replacement is that you will also need to buy the snap-on keyboard



Google Pixel C



Surface Pro 4

cover (or at least a Bluetooth keyboard) to make it a properly productive bit of kit. If you go the official route, that means shelling out another hundred quid on top of that eye-watering start figure. The tablet itself has a kickstand on the rear so that you can prop it up, laptop-style, and the aforementioned cover incorporates an ultra-thin keyboard and trackpad. You do, at least, get the 'Surface Pen' stylus included for free, however.

Of course, while the cheapest Surface Pro 4 is acceptably cheap in laptop terms, the more expensive the versions get, the less and less that seems the case. You could spend up to £2,199 on a Surface Pro 4. While that might be attractive to certain business users, it seems a ludicrously priced option to us.

Still, since it's really aimed at business users, it's no surprise that the Surface Pro 4 is a little out of the range of most students – but maybe you can look at it as spreading the cost. This is a tablet that will easily last a three (or even four) year course. If you can stretch to one of the more basic models, that might actually be worth it. [mm](#)



## Company Focus

# ShearsbyHill Computers

**S**hearsbyHill Computers is a relatively new firm, but it's also one that's already earning itself a positive reputation. Located in North Yorkshire, the company was started and is run by Lauren Shearsby and Nick Hill. Pooling their previous experience, ShearsbyHill was thus set up, and the values that are seeing it grow were quickly put in place.

From day one, customer service has been pivotal to the firm, Lauren Shearsby told us. The small team are very hands on, are available at the end of a phone or by email, and will and do work hard to make sure customers are happy. On the days not everything goes to plan, they personally put in the extra effort to put things right. This is a company that very much wants your business, and wants you to come back and use them again. Their efforts back that up.

So far, the focus for ShearsbyHill Computers has been on refurbished products. That's where their previous expertise really helps too. Lauren told us about the amount of research she did on the market, and how she settled on focusing first on refurbished laptops. Each laptop the company sells is tested, graded, and hand-checked, before it's listed and put on sale. Even when a machine has been bought and shipped out, the service doesn't stop there, and ShearsbyHill is proud of the fact that its support is UK-based.

Furthermore, its prices are very keen too. And the company is growing sensibly without over-stretching itself too. It's starting to expand the product range that it offers, to include desktop computers, networking equipment, scanners, and printers. It's still a deliberately tight product range that it offers, but there's diligence and care taken in putting said range together.

So why buy from ShearsbyHill Computers? Well, as Lauren told us, you're going to get a very good deal on refurbished technology, and a product you can rely on, backed up by a proper warranty, and a 30-day no-quibble guarantee. What's more, if you're in the North Yorkshire area, you can pop into the company's shop and see the product range and customer service in person.

It's a hands-on business this one, and a very human one. In an era when computing can look as if it's dominated by huge faceless companies who you buy from without ever having the chance to talk to, there's something refreshing and eminently welcome about ShearsbyHill Computers. Do consider giving them a try.

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# PC & MOBILE ACCESSORIES FOR STUDENTS

Could one of these handy gadgets make life easier?

**W**hether you're packing yourself off to University with your preferred smartphone, tablet and PC combination or just trying to live your day-to-day life in a connected world, you probably know that you can't live on smart devices alone. You need accessories that complement your hardware.

Luckily, there are plenty of gadgets out there that really help you keep life in order. So over the next few pages, we're highlighting ones we think you won't want to live without.

## **Kensington Portable Combination Laptop Lock (£20)**

When you're a student, your laptop can quickly become your life. It helps you communicate with friends, enjoy movies and television, and provides a place for you to work when you're on campus, staying in halls, or crossing the country to go back home. Laptops are easy to sell and light enough for a quick getaway, though, which makes them a prime target for thieves. Passwords and cloud storage can protect your data – but what about the hardware itself?

The best way to secure it is probably to use Kensington's

signature laptop lock. Never again will you have to worry if you step away from your laptop to get a book or drink, or leave it visible in your room while you're out. Simply attach the lock (plenty of notebooks support them) and any would-be thieves will be thwarted.

This lock in particular is great for students because there's no

need for a key, so you don't have to worry about keeping that safe too. All you have to do is keep the four-digit code in your head. The 1.8m self-coiling cable means you shouldn't have any trouble anchoring your laptop somewhere. The price is so low that it barely compares to the cost of a replacement, so whether you're at

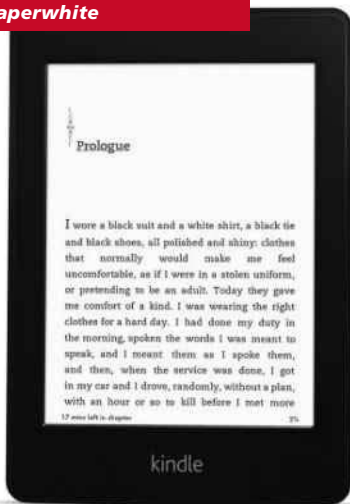
### **Kensington Portable Combination Laptop Lock**





## “ Passwords and cloud storage can protect your data – but what about the hardware itself? ”

**Kindle Paperwhite**



University or not this is one piece of hardware that anyone who uses their laptop in public should get hold of.

### **Kindle Paperwhite (£109)**

Students are expected to read a lot of books, and nothing's more frustrating than not having the one you need - except, possibly, having to carry books you might not need around in your rucksack at all times. Rather than weigh yourself down, it makes a lot of sense to buy an e-reader to take with you wherever you go – and of the available e-readers out there, it's Amazon's which will provide you with the simplest user experience.

The device comes in a few varieties, though the Kindle Paperwhite is the best all-rounder. It has a touchscreen which is also a self-illuminating e-ink display, so you can read it in dark or low light without any further attachments. There's 4GB of storage – a huge amount in terms of eBooks – and even if you own an earlier version, the current refresh has a new chip that gives it faster page turns and a slightly higher resolution screen. Not as much as the Kindle Voyage, admittedly, but that's a hefty 50% more expensive.

You can still buy a standard Kindle for as little as £60, so beware that you are essentially spending £50 for a light-up screen – but if you're into late-night cramming or just like reading in bed, the Paperwhite's going to save you time, money and effort in the long term.

### **IWOOT USB Fridge (£13)**

One of the downsides of shared accommodation is that you can't leave your room without the risk of bumping into someone. This is fine if you're feeling social, but when you just want to be left alone to work it can mean the difference between getting your revision done and waking up the next morning with a traffic cone in your room and no memory of how it got there. An in-room fridge is the ultimate

student accessory, and while mini-fridges are banned in most halls, no-one can do anything about something as innocuous as this: the USB mini-fridge.

Powered entirely over USB, this fridge is the perfect size for a single 330ml can, a few bars of chocolate or whatever else you fancy. You can use it to keep parts of your lunch fresh, save a snack for later, or just to make your friends jealous. The built-in cold plate starts chilling within seconds of being plugged in, and maintains a temperature of just a couple of degrees without any difficulty at all.

In case you're wondering, it's only taking power from USB so it's completely driver-free to activate and works on virtually any port, whether that's on a computer, TV, printer, or anything else. It doesn't even need to be that close to a USB socket to work because it comes with a four-foot cable so that you can easily trail it from your desk to the floor without having to drill a hole or balance it precariously. It won't just keep your drink cool – it'll make you look cool too.

### **Fire TV Stick (£30)**

It's debatable whether students need their own TV these days, given that tablets, smartphones, and laptops can do everything you want between them – but if you're wedded to the idea of a multi-screen experience (or perhaps going into a shared house) then a Fire TV Stick has bumped our previous favourite, the Chromecast, as the smart-streaming device of choice – largely thanks to its low price and Android compatibility.

Essentially, this turns any HDMI-compatible screen into a smart TV, giving you the ability to watch Netflix, iPlayer, and Amazon's own Prime service (what else do you need). You can also cast to it from any Android device, and connect a number of Bluetooth accessories including a game controller, so it's essentially a (somewhat limited) games console too. Access to a wide range of Android apps mean it's shaping up as a solid rival to the Apple TV, and integration with Amazon's online movie, music and TV content makes it a great reason to sign-up to Prime.

**IWOOT USB Fridge**



**Fire TV Stick**



While it doesn't quite meet the capabilities of the Apple's equivalent, it is a lot cheaper, and that goes a long way to making it worth your money. Perhaps not a lot of use if you're in halls, or don't have a communal area in your house, but it does mean you avoid the fight with the landlord over getting Sky installed. As all-purpose entertainment hardware goes, it's something we think any student could benefit substantially from.

### **SleepPhones (£30)**

If you want to try wearing headphones to bed without the risk of yanking your phone off the nightstand whenever you turn over, or having the earphones drop out just as your head hits the pillow, then SleepPhones are the answer. For £30, you can buy this headband-like device that incorporates two discreet speakers. It can pipe music, ambient noise, podcasts, or anything else you desire, directly into your ears as you rest comfortably.

If you've ever lived in a student house or halls of residence, you probably know why headphones you can wear to bed are a good idea. If you haven't, just try to imagine what a party sounds like at 4am when you're trying to sleep in the room next to it and have to be awake for a lecture at 9am. If you can successfully put yourself in that zone, you'll understand why we wished you could get something like this when we were still students. In short: if you can't get silence, the next best option is to drown out their noise with your own.

SleepPhones are machine-washable and available in a variety of colours and sizes from extra-small to extra-large (although the medium is likely to be enough for most people). The £70 Bluetooth versions probably work best, but if you want to save money and don't mind tucking your phone under the pillow you can get a cheaper, wired pair for half the price.

### **JBL Flip 3 (£80)**

Bluetooth speakers are definitely worth having because, let's face it, no matter how good your tablet's speakers are they won't have

the party jumping. If £80 seems expensive, remember that Bluetooth compatibility means they'll work with your phone, tablet, laptop and more besides, giving the Flip 3's excellent versatility.

If you're listening to music or watching TV, you'll appreciate the loud volume and high dynamic range. If you're using it as a speakerphone, the echo-cancelling mic will doubtlessly prove useful. If you're using it as a portable speaker, the fact that it comes with a tight-fitting protective pouch will make sure your investment is protected inside any rucksack, and the splashproof (though not fully waterproof) design even allows it to be used outdoors without any great concerns about the weather.

The unit itself can be positioned either horizontally or vertically, so it's undeniably space-efficient, and the built-in rechargeable battery allows it to run continuously for eight hours without any need for a recharge. As mentioned, it can also function

### **SleepPhones**



as a smart speaker for your phone, allowing you to answer and reject calls and switch between different callers. The aux input even lets you connect non-Bluetooth devices to it as well. As both speaker and speakerphone, it's got almost everything you need. It may not have the most original or extensive feature set, but it'll sit happily in virtually any niche, and that makes it essential to students.

**“ If you've ever lived in a student house or halls of residence, you know why headphones you can wear to bed are a good idea ”**

### **JBL Flip 3**







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### Maxtor M3 1TB (£45)

Despite the advances made in data storage technology, mechanical hard drives remain the best all-rounders for archival data storage: they're cheap, they store more than enough data for one person, and they generally remain functioning for years without any significant errors. If you're a student heading off to university, it's a good idea to get an external hard drive for storing backups of your work and filling out with other important data, like games, movies, and music.

The good points about the M3 range are quick to cover: a USB 3.0 interface means super-fast transfer speeds and file access times. Its 1TB capacity gives you enough storage for all manner of purposes. Crucially, it's powered entirely over USB, so there's no need to find a separate power socket to run it, and you get compatibility with almost anything that has a USB port, from computers and laptops to games consoles, set top boxes and even routers with network storage capabilities. It's also lightweight and portable but reasonably sturdy.

Take care, though – Maxtor-branded M3 drives are much cheaper rebadges of Samsung's M3 line, which cost around £30 more for the same hardware and capacity. Don't buy the wrong one!

### iStorage DataShur 4GB (£40)

If £40 sounds expensive for a 4GB USB drive, you need to take a moment to check out the feature set available to you on the iStorage DataShur line. This is a USB drive that places security above all else, and when you're a student keeping your data protected is important to prevent plagiarism and snooping. After all, flash drives are easy to lose track of, especially if you're travelling to and from the campus or dividing your time between work and a laboratory.

Happily, the security on iStorage's specially enhanced USB key is so strong that you could drop it in the middle of MI5 and not have to worry about anyone seeing your personal data. A combination of 256-bit encryption and hardware-based access code should ensure

that no-one but you can get at your drive's contents. Even a keylogger won't stand a chance of stealing your passcode because you punch it onto the device by hand, and the unit's military-grade hardware-based data encryption means that the contents are gibberish even if read directly from the storage cells.

Best of all, the device itself is what contains the security. There's no need for additional drivers or software, and it's compatible with any operating system. It's also water-resistant and constructed from shock-proof aluminium casing designed to shield it from the elements. We won't pretend it isn't expensive compared to bog-standard storage, but if security is a priority then it's tough to beat.

### Lexar Jumpdrive S73 (£6-£21)

If you're in the market for a USB 3.0 flash drive that doesn't resemble something Q made for 007, sooner or later you're going to find yourself staring down the barrel of the Lexar JumpDrive S73. They're cheap-looking, they're only a tad faster than USB 2.0 drives, and they're pretty flimsy too – but you can't argue with those prices. That's doubly true when you're a student looking for some cheap, portable storage, as it's a quality that's hard to ignore.

Although the RRP's are higher, if you shop around you can find a 16GB stick for £7, and the prices range up to £21 for 128GB. Quite simply, the pricing makes most of its inadequacies immaterial. Even if you're buying

the 128GB model, the slow speeds will barely stack up enough to be noticeable if you're shifting Word docs. The facts that matter most are that it's faster than every other USB 2.0 drive, and cheaper than almost any other USB storage drive around. We think the 32GB model (£8) is a fair balance between price and capacity, but you can't go wrong with any of them. [mm](#)

Maxtor M3 1TB



iStorage DataShur 4GB



Lexar Jumpdrive S73





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# CLOUD SERVICES EVERY STUDENT NEEDS

When you're on the move or away from home, The Cloud is your friend

**W**hen you've got multiple systems to manage and lots of different things to do on them, cloud services can become essential for keeping your work organised, secure and at-hand – not to mention that they can also afford you access to the entertainment you need to get you through the long day and longer winter nights. With so many options, it can be tough to know what services you really need to get you through your time in education – but we've hand-picked our favourites so you don't have to do all the legwork yourself.

## Productivity

### Dropbox ([dropbox.com](http://dropbox.com))

The best-known cloud storage provider, Dropbox gets away with a lot thanks to its recognisable name. It doesn't offer the most space, the cheapest pricing or the fastest speeds – but it does have a large and loyal fanbase, and that inspires confidence in a way few other things do.

One of the things Dropbox does do well is support every platform. It's the only provider with native apps for Windows, Mac OS, Linux, Android, iOS, Windows Phone and BlackBerry, and its API has been picked up by developers everywhere meaning you can access your storage direct from many other programs.

Free accounts start with 2GB of space, which can be increased using bonus and referral systems. For £6.58 a month you can up this to a massive 1TB of storage which includes 30-day versioning for deleted or altered files.

### Office 365 ([tinyurl.com/26n4xmh](http://tinyurl.com/26n4xmh))

Although it isn't free, Microsoft Office 365 is far from unreasonably priced, and far more powerful than Google Docs. It does at least try to justify its price by offering users access to the complete versions of Microsoft Office software hosted on Microsoft's own servers. Rolling updates mean you always get the latest versions of the software, with the features fully intact.

If you just want the online version of Office, full price is £80 a year which also includes OneDrive space. Students get a particularly good deal, though – there's a special university subscription which costs just £60 for four whole years, and includes licenses for two devices, 1TB of OneDrive and 60 minutes of Skype calling a month. That's pretty tough to beat.

Although it seems impressive, there is one potential issue with Office 365: it isn't well supported across devices. You can use the main suite on two PCs and the web apps work on any browser, but native apps for non-Windows devices aren't very well provided and may not even exist on your preferred platform. It is – despite claims of universality – aimed at desktop and laptop users above all others.

### VirusTotal ([www.virustotal.com/en-gb](http://www.virustotal.com/en-gb))

Acquired by Google some time ago (but still operating independently), VirusTotal is an online 'metascanner' that uses as many as 55 different antivirus engines to check any individual file you upload to its scanner or any URL you enter into its search engine. This makes it an incredibly useful tool for performing one-off checks.

It's even platform independent, meaning you can scan content from your tablets and smartphones as well as any desktop system.

A maximum file size of 128MB more than accommodates any files you might want to check, and although the number of engines does inevitably lead to some false positives on certain checks, it's easy to smooth them out – one positive identification versus 30+ negative ones suggests a problem with the scanner, not the file!

As tools go, it's virtually indispensable. Greater integration with the desktop would improve it, but as far as using the cloud goes, there are few tools that do it as simply and correctly as VirusTotal.

## Entertainment

### Netflix ([www.netflix.com](http://www.netflix.com))

Netflix is, without a doubt, the most popular of the online streaming brands, though as the market leader it faces increasingly stiff competition both at home and abroad. With a strong position in the market and a considerable history of pleasing customers, the question isn't so much why should you get Netflix as why don't you already have it?

Netflix's basic subscription costs £8 a month for access to the company's online library of movies, documentaries, and TV series. Anyone interested in trying Netflix can make use of a month's free trial, which can be accessed in advance of payment. The service can be cancelled at any point with no further obligation – although cancellation is instant and you won't get to use the remainder of the month. As a streaming-only service, it's worth noting





that Netflix has no offline mode, although it's available on a huge range of devices and platforms, and can even be used over a wireless mobile signal.

Content-wise, its original creations are much-lauded and highly spoken off. You probably know all this, of course, but if you haven't already got it there's no better time to sign yourself up – not least because you'll have plenty of free time to binge-watch in between lectures.

## **NowTV** ([www.nowtv.com](http://www.nowtv.com))

Operated by BskyB, NowTV's chief selling point is the inclusion of numerous channels that are normally only available through cable or satellite subscriptions. Now TV is the only way to legally view certain subscription channels without a set-top box, which is useful for situations where students cannot easily install their own hardware (i.e. a hall of residence or rented house).

Unlike most streaming services, NowTV operates on a subscription-free unlimited access model. There are three types of pass: Entertainment, Movies and Sport, ranging in price from £6.99 for a month's Entertainment pass to £9.99 for a month's Movies pass, and £6.99 for a day's Sport

“ **As the best-known cloud storage provider, Dropbox gets away with a lot thanks to its recognisable name** ”

pass. If you don't want to watch on a desktop or laptop, you can also buy a set top box that will stream NowTV content directly to your TV, although this is an optional component.

You can trial each type of pass for 14 days, which includes access to on-demand content. Again there's no offline functionality, but Now TV's contractless model makes it ideal for those who are staying at University or moving into student housing and want to take care of their own entertainment.

## **Spotify** ([www.spotify.com](http://www.spotify.com))

There are lots of streaming music services around (not least those of Google, Apple, and the more esoteric-but-high-profile Tidal), but by some distance the most popular is Spotify. Its biggest advantage – other than its library of more than 30 million tracks – is its support for virtually every platform you can imagine.

In terms of quality, Spotify is at the bottom end of the spectrum, however. Its free service offers music at just 160kbps, which is considerably worse than most commercially-sold digital music. Its premium service is still only 320kbps – far lower than the CD-quality audio offered by audiophile-focused services. This makes Spotify a casual choice that isn't necessarily aimed at those with high-end audio equipment, but it hasn't stopped it being hugely popular.

There are two main tiers for Spotify subscriptions. The first is the free, ad-supported model, which has some limits, such as online-only listening and skipping no more than five tracks in a row on the mobile version. The second is a Premium version (£9.99 a month) which, in addition to higher-quality audio is ad-free, drops any listening restrictions, and also has a small number of exclusive albums unavailable to free users. [mm](#)



# STUDENT SECURITY TIPS

## Keep hardware and data safe with these seven nuggets of advice

**S**tudents are extra-vulnerable to crime. Campuses, university halls and shared housing are all full of easily-pilfered consumer electronics, while also being conveniently anonymous places within which to operate. In short, they're a virtual smorgasbord for any career thief – and when you're on a low income, even a minor theft can cause trouble.

Protecting valuable hardware should be of primary importance to everyone, but particularly students. As well as the hardware, which could prove expensive to replace, there's the need for data security too. Your device might contain work that's crucial to your course, or personal information that could be used towards greater fraud, but in many cases lost data is irreplaceable in ways that lost hardware never is.

The last thing Micro Mart wants to do is scare you, but here are 7 things you can do to protect your data and your investment.

### 1 Keep Devices Hidden

How can you protect yourself against theft? Short of joining the police force or putting on a Batman suit, it's really just a question of risk minimisation. Making your device less visible to thieves can help. It probably goes without saying that you should never leave it unattended, but we're going to say it anyway. There are a few other things you could do, too, though.

Think about appearances – a laptop or tablet case makes an obvious target, but a discreetly-styled rucksack or satchel should draw far less attention. If you have to leave it alone for any length of time, cover it with a book or coat so that it's not out in the open.

### 2 Secure Information

As another countermeasure, you should look at minimising the information someone can get out of your PC once they've got it. Unfortunately, once someone's

physically got hold of a PC it's near-impossible to prevent some amount of access, but a secure password and encryption of important files will hopefully encourage all but the most dedicated crooks to simply wipe it clean and sell it on, rather than waste time looking for passwords and personal details.

### 3 Get Insurance

If the worst does happen, you'll need some way of replacing the hardware. Data is a separate issue, but if you need a computer to work on then an insurance deal can, hopefully, make sure you get one without having to take a huge financial hit.

Most large insurance companies offer some kind of gadget insurance covering loss, breakdown, damage and theft, but there are some smaller providers who have services built around computer hardware. For students, it's probably best to look at Protect Your Bubble



([uk.protectyourbubble.com](http://uk.protectyourbubble.com)), which offers low-price gadget insurance, with discounts if you cover multiple devices. The excess is low and monthly costs are tiny, with the insurance covering theft, breakdown, accidental damage and some (but not all) loss.

### 4 Use Remote Tracking

Theft isn't the only way you might become separated from your device. You might accidentally leave it somewhere, or drop it without realising, or have it taken from you by a legitimate case of mistaken identity. If this happens, there are a number of programs that can help you recover your device as long as there's an Internet connection nearby.

For example, iPhones and iPads both have the 'Find My iPhone/iPad' app, which allows users to remotely communicate with their device, as long as it's switched on and within range of an Internet connection that is. Similar applications are also available for Android phones and tablets, while owners of Laptops (and other non-Apple devices) can use Prey ([preyproject.com](http://preyproject.com)).

### 5 Use Strong Passwords

One of the simplest ways to secure your data against the dangers of theft is to use an entry password or passcode. On smartphones and tablets, you can set up your options so that

repeatedly entering an incorrect code will wipe the phone, ensuring your personal information doesn't fall into anyone else's hands. In many cases the data can't then be recovered by someone without specialist hardware, which prevents a bad situation from becoming even worse. If you recover the phone, most of the data can then be restored from automated backups or by re-downloading your purchases from the relevant app store. Inconvenient, yes – but a small price to pay for security.

On laptops and desktop PCs, things are slightly less simple. A password can be used to protect user accounts against outside access, but it's worth remembering that Windows' default protection doesn't stop thieves from accessing the data inside a user account if they remove the hard drive and put it into another system. BIOS passwords are similarly ineffective – they may prevent anyone from accessing the PC in the short term, but clearing a BIOS password is rarely a difficult procedure, and removing the storage hardware will allow quick access to the data on it.

### 6 Backup Regularly

The one piece of advice no-one ever takes – and which everyone regrets not taking when things go wrong – is to make backups. If your computer gets stolen or destroyed, nothing will

comfort you more than having the most important bits of it backed up and readily accessible – especially if you're a student working on your dissertation or coursework!

Backup plans can be as simple as periodically copying your most important files to a USB key or as complicated as maintaining a cloud storage mirror. It may all sound like more housekeeping, but nothing will soothe the pain of losing a computer like having your files available straight away. After all, without its files, the computer is just a collection of components, that can ultimately be replaced. Your data can't!

Remember, however, not to keep backups in the same location as your PC or device, just to make sure they don't get stolen or damaged at the same time. If you're storing a backup of your work on a USB key, put it in your pocket instead of your bag! This is why cloud backup services, such as Dropbox or Microsoft OneDrive are such a good idea as a fall-back.

Remember, too, that if you're in academic trouble because of a theft, you can at least take a police report to your tutor and plead for leniency. If you're in trouble because you failed to make a backup, that's all your responsibility!

### 7 Install An Antivirus

If you're sharing hardware with other people (especially storage hardware) or using the same networks as multiple computers, then an antivirus is even more essential than it usually is (that's saying something). All manner of malware can cause permanent damage to your data and sometimes even hardware, not to mention open you up to identity theft and financial fraud.

There's no excuse for not having an antivirus, especially because some of the best are free. You can download one for your laptop or PC from [free.avg.com](http://free.avg.com), with an Android version also available (iOS devices don't need one).

And despite all of our dire advice, remember that we're still talking about worst-case scenarios. Many people are never the victim of a computer-related crime, and in an ideal world all of these precautions will be for naught. [mm](#)



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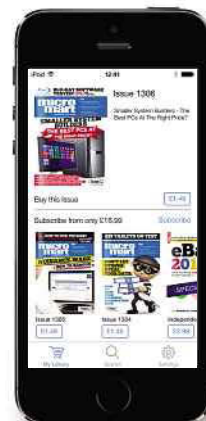
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# All The Fun Of The Fairs

**Remember the All Format Computer Fairs of the 1990s? Bruce Everiss does – because he ran them for nearly 20 years. He talks to David Crookes**

**A**ll Format Computer Fairs boomed in the 1990s thanks to the efforts of Bruce Everiss, the former operations director of Imagine Software and the ex-operations manager of Codemasters. Run up and down the country between 1988 and 2007 in venues as varied as Haydock Park Racecourse in the North West and Tolworth Recreation Centre in London, they were noisy, bustling marketplaces for all things computers.

**Micro Mart: When did you get the idea for the All Formats Computers Fair?**

**Bruce Everiss:** There had been computer fairs before such as the ZX Micro Fairs organised by Mike Johnstone at the Royal Horticultural Hall in London in the early 1980s. Those had long died out. My first new idea was to put everything computing under one roof.



Everyone said that this could not be done; that you could not mix primarily games machines with primarily business machines. My second idea was to take it to the country, Birmingham, Washington, Bristol. Everyone said that this would not work, that only London was a big enough market to sustain these events.

**MM: And was it?**

**BE:** It transpired that London was a pretty rubbish place to run fairs. Too expensive, no parking, reliance on public transport, expensive and inefficient marketing etc. etc. It was only in the regions that they really worked. People could drive to them and park outside and the venues only cost a small fraction of London ones to hire.

**MM: How were the Fairs run?**

**BE:** I ran it as what is known as a virtual business. With no employees. Everything was sub-contracted out. Stand sales, table supply, front desk, security, catering and so on. So I could run three different fairs around the country on the same day in February and then run no fairs during the whole of August.

**MM: What was computing like at that time and which machines were popular?**

**BE:** This was about 1989, so times were dire. The home computing industry had been destroyed by tape-to-tape copying which killed off the game companies.

The Amiga and Atari ST had appeared but they were only a fraction as popular as the 8-bit machines had been. The IBM PC and clones – such as Compaq – were out there, but the gaming and home computing market for them was pretty undeveloped. I really launched the fairs on the back of the SAM Coupé, for which there was a lot of interest.

**MM: What was the first show like – were there any mishaps?**

**BE:** The first show was just about perfect, which is why I kept on running them.

**MM: It grew at a fast rate and soon there were dozens of traders. Was that a surprise?**

**BE:** Building the business was very hard work, 100-hour weeks for a very long time, 12-hour days during the week and 18-hour days at weekends. Also, it cost money to get each new fair established, mostly in free stands to traders, so that there would be sufficient product for it to be worth the public attending.

**MM: Which venue was most popular?**

**BE:** The Motorcycle Museum in Birmingham was the first hit show, then Washington, Tyne and Wear became a monster. Ultimately Bristol became immense, too – easily the biggest computer fair in Britain. All these fairs had more than 200 tables out and more than 2,000 people through the door.





▲ Bruce hoped his Fairs would capitalise on the SAM Coupé, a British 8-bit computer that made its debut in late 1989 and was able to emulate the 48K ZX Spectrum. It sold 12,000 units



▲ Computer trader Rakewell (rakewell.com) was a regular visitor to the All Format Computer Fairs

**MM: When did traders start following the show around the country?**

**BE:** Some traders were very local, but most of the big successful traders followed me everywhere. It was their business. Many of them made a lot of money. In cash.

**MM: What items became the big sellers?**

**BE:** I ran the business for about 18 years, so things changed a lot. Floppy disks came and went. Multimedia CD-ROMs came and went and so on – the continually changing shape of computing.

**MM: What do you remember with fondness?**

**BE:** There was a lot that was just brilliant. Many of the traders were amazing people. Very hard working, very entrepreneurial. We stayed regularly in the same hotels around the country and had some incredible booze-ups. The camaraderie amongst all of us was superb. Also, we ran fairs in England, Scotland, Wales and Northern Ireland, so we got to see a lot of the country.

**MM: What do you wish hadn't happened?**

**BE:** The really bad thing that happened was being systematically stolen from on a huge scale. The business wasn't working when it should have been... I was made personally bankrupt. The business was rescued by my friends and family who rallied round and were utterly fantastic.

**MM: Why did they end, and do you think you could ever resurrect it?**

**BE:** The whole reason the computer fairs worked was because you had lots of traders under one roof competing against each other. This gave the public an immense range of products and fantastic prices. Some traders were buying by the container load direct from Asian factories and then selling directly to the public at fairs. No middlemen.

But the internet could do all of that even better. An even wider range of

products and even better prices. I closed the fairs down one by one as they became unprofitable until there was only Bristol left.

Then the council decided to demolish the venue, so I called it a day. I think that a really big fair could be made to work even now, but it would cost a fortune to get off the ground. **mm**

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▲ A typical advert for the All Format Computer Fairs held across the UK

“ Many of the traders were amazing. Very hard working, very entrepreneurial. We stayed in the same hotels and had some incredible booze-ups ”

## Three Top Computer Fairs

Although the All Format Computer Fairs are no more, there are still some market-style events still exist today.

### Premier Computer Fairs

[premiercomputerfairs.co.uk](http://premiercomputerfairs.co.uk)

The next fair will be at Wolverhampton Racecourse on September 18th (10am-3pm), but others are held in Coventry, Nottingham, Sheffield, Stoke, Tolworth, Croydon and Bristol.

### Play Expo

[playexpomanchester.com](http://playexpomanchester.com)

Play Expo Manchester has lots of stalls selling new and old games and it will be staged once more at EventCity on the 8th and 9th of October. Events also take place in Glasgow, Margate and Blackpool.

### London Gaming Market

[londongamingmarket.com](http://londongamingmarket.com)

If you want retro videogames, board games and merchandise, this relative newcomer runs every four months and is set to take place at the Royal National Hotel in Russell Square, London, on November 6th.





# Best UK Web Hosting Deals Right Now

**Are you looking to build a website or move one? Roland Waddilove provides the tips and best deals**

**W**eb publishing has really taken off in the last few years and this is partly because it is cheaper and easier than ever to create your own website. Everyone from hobbyists to big corporations have their own online presence, and you can have one too for as little as a pound a month. Yes, it really is that cheap.

It is possible to have your website up and running in minutes, just by filling in a form and clicking a button or two, although it will take a bit longer to fill it with content. It does not require expert knowledge either, so don't let that put you off. Content management system like WordPress has made web publishing very



easy. Web hosting companies will even set everything up for you and all you need to do is to think of a name for your site.

If you have not yet created a website or if you want to move from your existing hosting company to get more features or a better deal, what are the features you should be looking for? Here we take a look at what you need and what some of the technical terms mean. Then we will look at the deals on offer from some great UK web hosting companies.

## Web Hosting Options

Websites can be hosted in different ways. The most obvious method is to install web server software and host your website on a PC. Hosting companies have numerous racks of slot-in PCs, and this is certainly possible, but it is very expensive to have your own dedicated hardware for your website.

At the budget end of the web hosting market is so-called 'shared hosting' where many websites are installed on one server. It looks to you like you have your own dedicated web server, but at the back end is a PC running lots of websites. The advantage of this is cost; because the hardware is shared among many sites, this can be as little as £4 a month for shared hosting, with special introductory offers for the first year as low as £1. Make sure you check the price after the first year in the small print, though, so you won't get an unexpected shock when the hosting comes up for renewal.

Shared hosting is cheap, but the disadvantage is performance. One problem is that a web host can install too many sites onto a server with the result being that they all run slowly. A slow website that takes 10 or 20 seconds to display a web page can affect your visitor numbers and people might leave rather than wait for a page to load.

Another problem is that one website could be poorly designed or have a lot of traffic, and this causes it to use most of the processor power and RAM. This leaves little for everyone else and your site can run suffer from performance problems.

The cheapest shared hosting usually has the most shared sites, but for a few pounds each month you can have your own website. It's fine for personal sites, hobbies and for learning about website development. Pay more you get more powerful server hardware that is shared with fewer sites and this increases the responsiveness and speed of your website. It can then cope with more visitors if it becomes popular.

VPS stands for Virtual Private Server and it is a form of shared hosting, but it is a step up in security, privacy, and performance. Each server is run like a virtual machine and it has its own private workspace. You are still sharing the hardware with other websites, such as the processor and memory, but it is done in a way that is less likely to be affected by the activities of other sites sharing the same hardware. It offers some of the benefits of a dedicated host, but with lower costs.

Cloud hosting is another hosting option and as with cloud storage and other cloud services, your website is hosted somewhere online. It is distributed over multiple servers, so there are many processors, many disk drives, lots of RAM, and so on. One benefit is reliability because if one hard disk fails, for example, the others just carry on until the unit is replaced. If more processing power or RAM is needed, it can be scaled up to provide it.

Companies with high traffic websites choose dedicated server hosting because it provides the best performance, security, and reliability. The cost, for even the most basic hardware, starts at over £30 a month and can run to hundreds, so you have to be serious about your website and making money from it.

With dedicated hosting you get to choose the hardware and at the budget end of the range you might get a two-core processor, a 500GB disk drive and 2GB of RAM. Even budget PCs have a better hardware specification than that, so it isn't going to offer spectacular performance.

If you have a popular website that gets a lot of traffic, or if that is your aim, then better hardware is required and there are may be options to increase the number of CPU cores to four, eight or more. Some web hosts offer 2x 10-core Xeon processors for example. That's nice if you have £300+ a month to spend on your web hosting.

## Features You'll Want

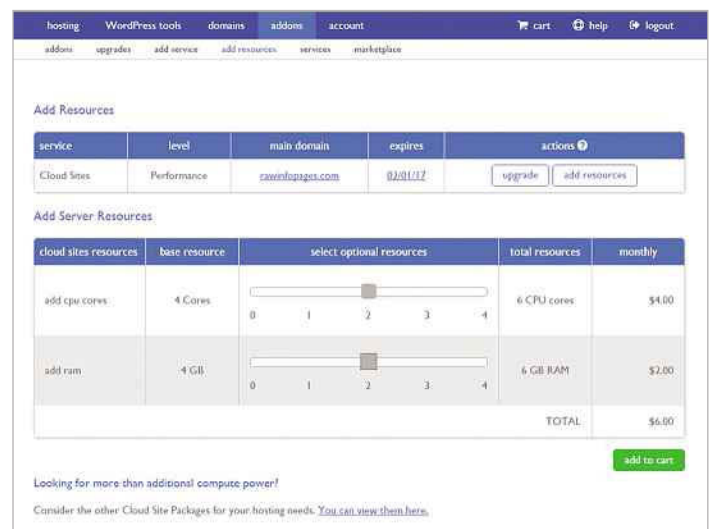
We all know how much faster a PC is with a solid state drive (SSD), so you can imagine what a difference it might make to a web server. You won't see them at the budget end of the hosting market, but it is often an option on middle to upper range deals. There may be a combination of mechanical drive and SSD, so you could get 1TB of storage along with 128GB SSD to speed up the server software. It is worth paying a bit extra for.

Websites don't require much disk space and whether you get 500GB, 1TB or unlimited storage is unimportant, unless you are someone like Facebook or Instagram that has millions of people uploading photos and videos every day.

Any website can be moved, so if you have outgrow a service plan and need extra performance or features, you can choose any deal with any web host. Moving web hosts is not easy, though, and you might need the help of an expert. Many web hosts provide this service.



▲ Is your website on a shared server? Use [tciputils.com/domain-neighbors](http://tciputils.com/domain-neighbors) to find out



▲ Some web hosting packages allow easy upgrades, like these sliders

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BILLED ANNUALLY Pocket-friendly hosting for a small informational website or your first simple site.	BILLED MONTHLY Feature-rich hosting for a small business, blog, or other database-dependent website.	BILLED MONTHLY Host up to three blogs, businesses or communities on one fast multi-site package.
1 website	1 website	3 websites
5GB Web space	Unlimited Web space	Unlimited Web space
30GB Monthly bandwidth	Unlimited bandwidth	Unlimited bandwidth
1,000 Mailboxes	10,000 Mailboxes	Unlimited Mailboxes
	Unlimited MySQL Databases	Unlimited MySQL Databases
	WordPress One-click Install	WordPress One-click Install

▲ The Home Pro plan from Heart Internet looks ideal for most users

A much easier option is to stay with the web host and to simply upgrade to a better server or increase the resources. When choosing a hosting plan you should find out what upgrade options are available. You can often start off with a cheap hosting plan and then upgrade as your site grows. Find out what upgrades are available, and if there is a cost involved. Often there isn't and you simply sign up for a new deal and the web host does all the work.

Budget web hosting uses shared servers and your site might be one of 100 or more. Not only does this affect performance, you share an IP address. Other sites with your IP address might be doing something dodgy, like sending out spam. If the IP address is blacklisted then everyone that shares the IP address might also be blacklisted too.

It is clearly better to have your own IP address and this means avoiding the bargain basement hosting deals and choosing one of the more expensive ones. Check whether your own unique IP address is included in the plan.

One-click installs are really useful. This refers to content management systems like WordPress, Joomla, Drupal and others. You fill in a simple form, often with just a website title, username, and password, click a button and 30 seconds later you have a website up and running. It's a no-brainer and most web hosts offer to set up at least WordPress for you. All you have to do is to start posting.

MySQL databases are used by WordPress and other content management systems. Having more than one enables you to run more sites or subsites. For example, you might run a website, a blog and a discussion forum and each requires a database. Hosting plans that offer more than one are therefore useful. Sub-domains are also handy and you could have [mysite.com](http://mysite.com) with [blog.mysite.com](http://blog.mysite.com) and [forums.mysite.com](http://forums.mysite.com) as subdomains.

## DEALS: Heart Internet

[heartinternet.uk](http://heartinternet.uk)

Heart Internet offers a wide range of hosting deals and they are organised into Web Hosting, Premium Hosting, and WordPress Hosting. That last category just highlights the best WordPress hosting deals in Web and Premium.

The cheapest hosting deal is Starter Pro and it costs just £2.49 a month. For that you get 5GB of disk space, 30GB a month bandwidth and 1,000 mailboxes. It does not include WordPress installation, but if you use a website builder application on your PC, you can create your site and upload it.

**WORDPRESS HOSTING BY 1&1 - THE SECURE CHOICE**

- ✓ IMPROVED Easy installation
- ✓ NEW Up to 50% faster with full SSD storage
- ✓ NEW Enhanced security with DDoS protection

1&1 Managed WP BASIC	1&1 Managed WP PLUS	1&1 Managed WP UNLIMITED
The best choice for photoblogs and medium-sized WordPress projects.	Ideal for large WordPress websites, with top performance.	Perfect for demanding WordPress projects, with guaranteed resources.
12 months £1.19/month <small>5.99 then £5.99/month*</small>	12 months £4.79/month <small>8.39 then £8.39/month*</small>	12 months £8.39/month <small>14.99 then £14.99/month*</small>
Continue	Continue	Continue
✓ 1 WordPress Project	✓ 5 WordPress Projects	✓ Unlimited WordPress Projects
✓ 50 GB storage on SSD	✓ 250 GB storage on SSD	✓ Unlimited storage on SSD
✓ Unlimited Visitors	✓ Unlimited Visitors	✓ Unlimited Visitors

▲ The best deal at 1&1 is the Managed WP Plus. It has everything you need

A better deal is the Home Pro priced at £9 a month, which includes unlimited disk space, bandwidth, MySQL databases, and mailboxes. Most importantly, it offers one-click install of 70 web apps, including WordPress, discussion forums, shops and ecommerce, so getting your site up and running is a breeze – and it supports subdomains.

The Home Pro deal is shared hosting and is our recommended plan, but if you want more reliable performance, the Premium Hosting plans provide it. Base costs £29.99 a month and for this you get dedicated hardware that includes a 50GB SSD and 4GB of RAM. With Premium Hosting, Heart Internet says the performance of your site will not be affected by other users on the server. One-click installs of all the most popular web software is available. Support is 24/7 and UK based.

## DEALS: 1&1

[1and1.co.uk](http://1and1.co.uk)

Unless you can find web hosting for free, 1&1 must surely offer the cheapest deals around, and the Basic plan priced at £1 a month sounds amazing. However, this is for the first year only and excludes VAT. It's normally £6 inc. VAT. That is still cheap, though, and it includes unlimited web space and websites, 20

**Option 1** Choose a pre-built web hosting package

Pre-Made Packages...

**Option 2** Build your own web hosting package

Email Accounts: 5  
 Disk Space: 5GB  
 Databases: 2

O.S. Select: Linux (selected), Windows  
 Billing Period: Yearly

**Add To Cart** Total: £63.00

How can we improve our website?  
 To help us bring you the best possible service, we'd love your feedback on any aspect of our website, good or bad.

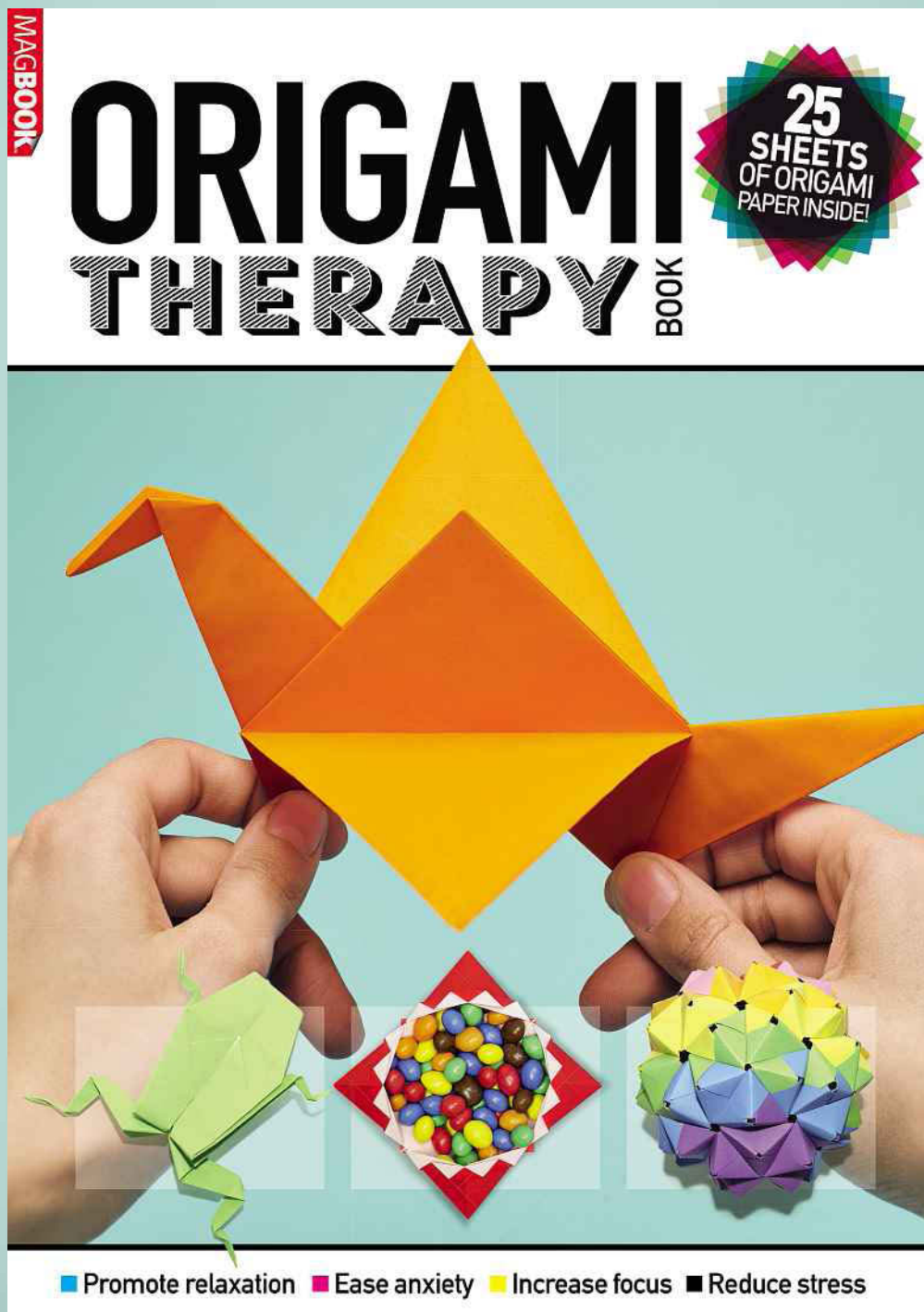
Take our 10 second survey

▲ Use Easyspace's Pin 'N' Mix web hosting configurator to select your requirements




# Time to relax!

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Overview Cluster platform Features Why choose us FAQs			
Choose an OS  Linux OR  Windows			
Features	Ignite 12 month special offer £2.50pm	<b>Momentum</b> 12 month special offer £7.00pm	Ultimate 12 month special offer £15.00pm
Websites	1	3	100
Tech support	24/7 support	24/7 support	UK 24/7 support
Smart SSD web space	10GB	20GB	120GB
Databases	2 x 1GB databases	20x 1GB databases - low contention	120x 1GB databases - low contention
SEO Tools	basic	advanced	advanced
Mailboxes	5x Mail Extra (2GB)	100x Mail Extra (2GB)	1000x Mail Extra (2GB)
1 Year Free Domain Registration (Choose one of: .uk, .co.uk, .com, .website, .club, .london)	✓	✓	✓

▲ **Avoid the cheapest deal. Fasthosts' Momentum is recommended**

MySQL databases stored on an SSD for speed. It also includes an SSL certificate for secure https connections, and 120 Click&Build applications, which are one-click installs of popular web applications like WordPress. This is great for beginners who want to explore web development.

The cheapest deal isn't always the best, though, and that web server runs in 600MB of RAM. Such limitations might hamper performance if your site grows, so the Plus plan is better. It costs £8.39 a month, has unlimited web space and websites, 500 MySQL databases on an SSD, plus 1.2GB of RAM. Also in the deal is Sitelock Basic (secures your website from hackers), and 1&1CDN (Content Delivery Network, which speeds up your site). The Pro plan offers more databases and, more importantly, 2GB of RAM.

Those deals are tempting, but the one we would recommend is 1&1 Managed WP Plus. It is designed for creating WordPress websites and you can create up to five projects with unlimited visitors, a 250GB SSD, unlimited email accounts, 1&1 Sitelock, pre-live staging, 1&1 CDN and more. It's £8.39 per month.

## DEALS: Easyspace

**easyspace.com**

There are several hosting plans on offer from Easyspace, but the Pic 'N' Mix feature is that one that stands out from the rest for our money. There are two options, the first of which is a selection of preconfigured hosting configurations, where you can choose a company website with 20 users, a download site, a site with lots of page hits, or a database-driven large site.

The second Pic 'N' Mix option is the best and there is a choice of Windows or Linux servers (Linux is best for most people), and sliders that enable you to choose the number of email accounts, disk space, and MySQL databases. The minimum hosting package with 3GB of disk space costs £24 a year. Email accounts can be added for 60p each, databases, such as for WordPress, cost £15 each, and extra storage is £3 per gigabyte. Using this system, a basic site with 10 email accounts, two databases, and 5GB of disk space is £66 a year.

Our recommended deal, however, is the Business account, which costs £8p/m – with discounts if you sign up for multiple years. It has unlimited web space and bandwidth, subdomains, 200 email accounts, unlimited MySQL databases, one-click installation of popular web applications like WordPress, and more.

## DEALS: Fasthosts

**fasthosts.co.uk**

Fasthosts offers more variety than some companies and there are three distinct hosting types. There is the normal web hosting, which is the usual shared server, there is dedicated server hosting, and cloud hosting. The deals are worth checking out, but you do need some technical knowledge to make sense of the different plans.

The cheapest deal is £6 a month for the Ignite Cluster (£3p/m for the first year). It provides 10GB of web space, two MySQL databases, five mailboxes, easy install of content management systems like WordPress, unlimited bandwidth, and sub-domains. The Momentum deal is better and it has more web space, more databases, more mailboxes, but more important, you share the server resources with fewer people, so the performance is better and less likely to be dragged down by others. Momentum costs £8.40p/m for the first year and then £12 a month and it is our recommended one.

Choosing a dedicated server is like picking a PC. You can select the processor, RAM, disk capacity, add an SSD, and so on. The cheapest option is 571 (the server types are numbered), at £29p/m. Cloud servers are more flexible but are best for businesses. Web servers run on virtual machines and you can increase or decrease the amount of processors, memory, and disk space. The prices depend on the virtual hardware you specify, but start at £29p/m.

## DEALS: 123 Reg

**URL: 123-reg.co.uk**

123 Reg is not just for registering domain names, it offers a full range of website hosting packages including traditional shared hosting, virtual private servers, and dedicated servers. There are also some easy options to get you started, such as the WordPress, Joomla, and Drupal hosting deals. The Business account costs £3 a month for the first year and then £5, and is an okay starter package – plus, your content management system is set up with a click.

All hosting packages include easy and quick setup of popular CMS like Wordpress, and there are many options. The four 'traditional' packages range from £2.49 a month for Essentials up to £20p/m for Premium+. The two in the middle – Business and Unlimited, costing £5 and £10 a month respectively – will suit the majority, though. Business is fine, but Unlimited gives you unlimited databases and web space, SSL, better performance, and UK-based support; for those reasons, it is our recommended 123 Reg option.

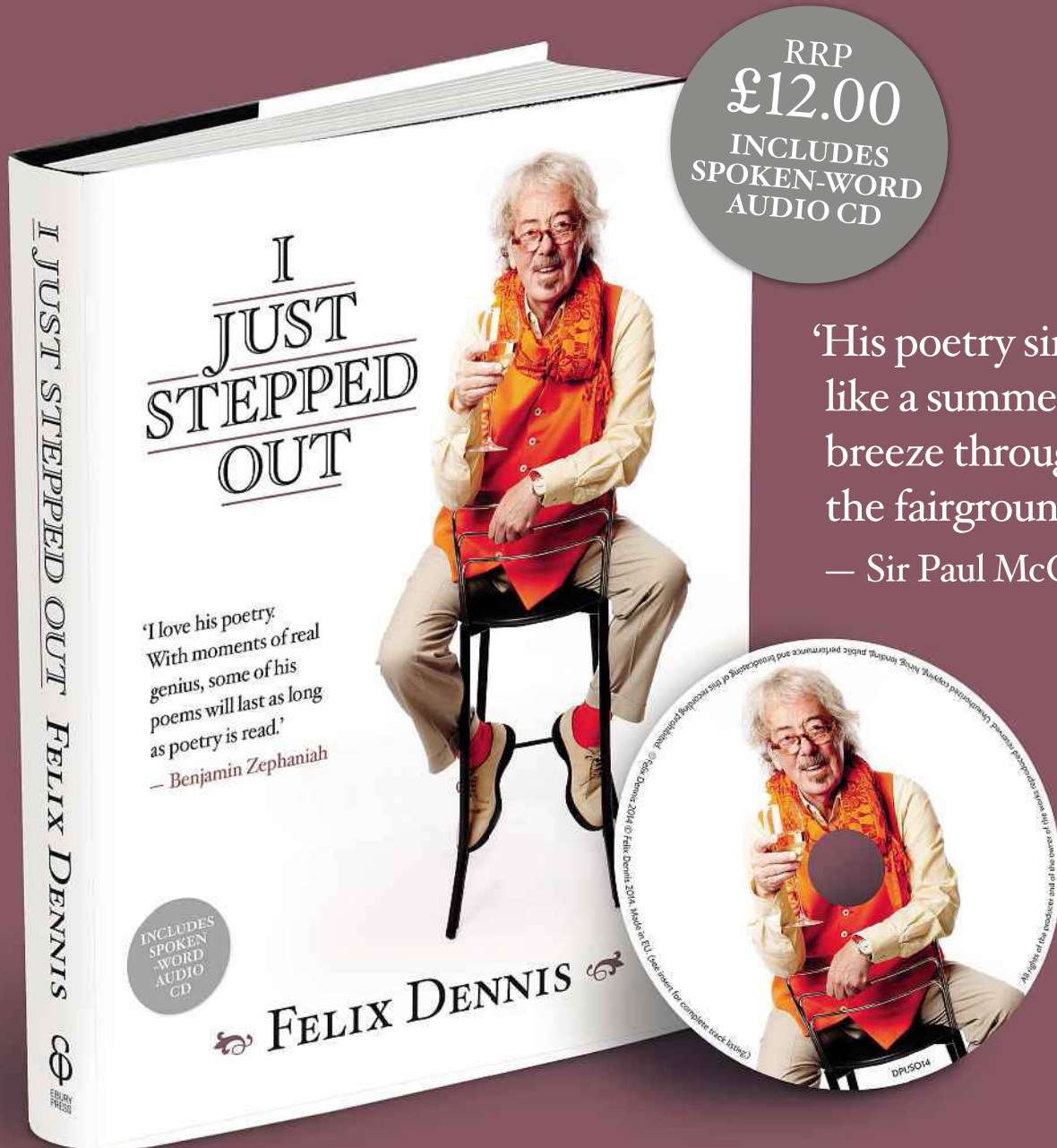
The dedicated server packages are pricey and start at £49 a month, and there are VPS packages from £10 a month. **mm**

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Performance	Performance	Performance
Included domains	Included domains	Included domains
Websites	10	Websites
Web space	Unlimited	Web space
MySQL	Unlimited	MySQL
Database size	1GB	Database size
Included SSL	✓	Included SSL
Dedicated RAM	✗	Dedicated RAM
SHOW FEATURES	SHOW FEATURES	SHOW FEATURES
1 year £83.88 ex VAT @20%	1 year £164.85 ex VAT @20%	

▲ **This is our pick of the hosting deals from those on offer at 123 Reg**



# I JUST STEPPED OUT



‘His poetry sings  
like a summer  
breeze through  
the fairground.’  
— Sir Paul McCartney

A startlingly honest and intense collection, *I JUST STEPPED OUT* is a kind of ‘last will and testament’ in verse. Written by Felix Dennis after his diagnosis with terminal cancer, these poems chart his physical, emotional and psychological journey.

Available now from Amazon and all good booksellers.



For more information on Felix Dennis go to: [www.felixdennis.com](http://www.felixdennis.com)

# What's In Android Nougat?

## David Crookes digests the key features of the latest Android flavour

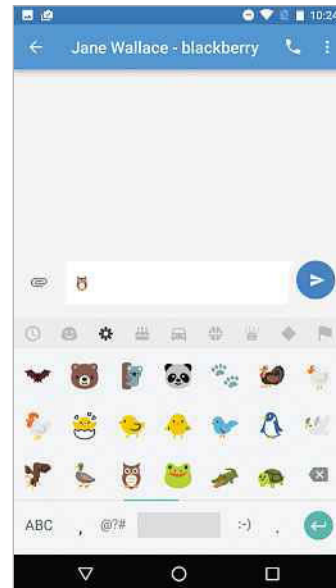
**A**ndroid Nougat has finally arrived and has begun appearing on a host of phones. As the seventh major revision of the operating system, it has been in developer preview testing for the past five months, bringing with it a host of changes that could make for a very useful and productive upgrade. With a bit of luck, you'll already have it nestling nicely on your phone – but if not, here are some of the things you should be looking forward to.

### Split-screen Apps

We're already multi-tasking like mad with our technology but Nougat is allowing you to take things a little further. Its killer feature is the ability to have two apps on screen at the same time which is great if you need information from one app while working in another. When you're in the split-screen mode, you're able to move a slider up and down (or left to right depending on which way you're holding it). This alters the amount of space each one is able to enjoy. To activate the split-screen mode, you simply have to long-press the square button and then select a second (compatible) app to fill the space which appears. You can also quickly move between two open apps by double-tapping.

### Enjoy More Emojis

Maybe there will come a time when we communicate entirely with emojis; things certainly seem to be heading in that direction, with Android appearing to think that we need more of them. It has added 72 extra tiny pictures to the 1,500 it already has, representing the second major emoji update in 10 months. We now have access to an avocado, an owl, people with a wider variety of skin tones, and some modern life reflections such as selfie emojis, face palms, and shrugs. There's also a 'rolling on the floor laughing' emoji, a Mother Christmas, and a wilted flower. That's not the only texting tweak, though: Android's creators are

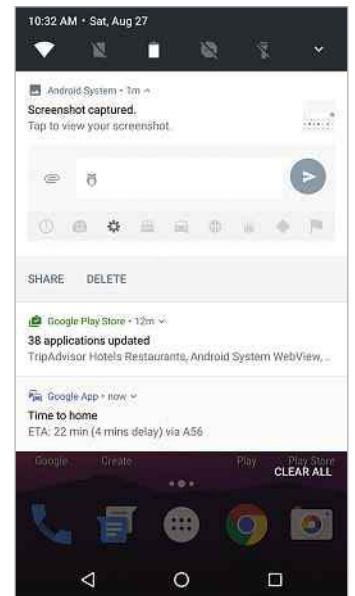
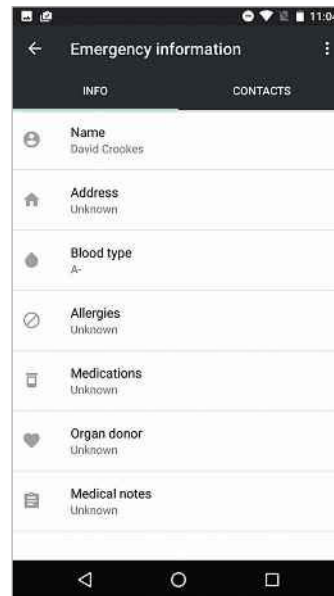
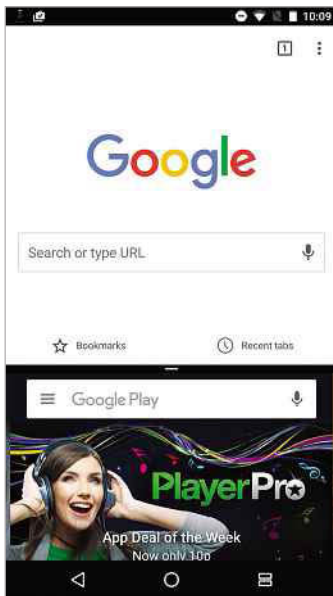


also excited about a second keyboard addition that gives you the ability to use two or more languages at the same time, thanks to multi-locale language settings. A godsend for the bilingual families out there, no doubt.

### Notification Direct Replies

In previous versions, whenever you received a notification, you had to pop to the app it corresponded with in order to respond. Now, just like in iOS, you can simply pull down to see the notification window and tap out your reply there and then before getting on with the task in hand. This should boost your productivity and make interruptions much less of a problem.





You'll notice too that the notification menu has been tweaked so that important controls such as toggling wi-fi, viewing your battery usage, activating Do Not Disturb and going to your flashlight, alarms, Bluetooth and more are at your fingertips (you can re-arrange the tiles to suit). Notifications also have tinier fonts and are stacked, to make better use of the space. By long-pressing on a notification, you can bring up a mini-menu that lets you show notifications silently or block them all if you wish.

## Limit Data Saves

If you delve into your data settings and navigate to Data usage, then you can activate a new data saver function. When you turn this on, you will be able to tell Android which apps you want to bar from sending and receiving data when they are not in use. Any apps you tell the phone to block will not be able to access cellular data in the background, which could save you money depending on the kind of plan you are on.

## Doze On The Go

The Doze function was introduced in Marshmallow, but with Nougat there have been some extra refinements. Doze is now better tied in with battery optimisation and it activates in more situations than before, which means it will have a nice little nap on more occasions when nothing is happening including every time the screen is off. You don't need to do anything to benefit from this because it just happens right out of the box, so to speak. It will prolong the battery life of your device, though, which is always a good thing in our book.

## Allo, Allo, Allo

Android is debuting two new apps with Nougat: Allo and Duo. Allo is a messaging app that is set to be launched soon, although it's currently available for pre-registration. It will allow you to have engaging chats with your friends and family while looking up information and asking for answers on Google without the hassle of leaving your conversation. It will also figure what you're going to say before you've even thought of it, allowing you to respond in your own style using whatever it suggests. It's potentially a revolutionary messaging service that also incorporates the ability to doodle on photos, change the size of text with a swipe, add stickers and add end-to-end encryption. We're looking forward to seeing it.

Duo, on the other hand, is very much here and available. It allows you to make video calls and it's already proving very popular with five million downloads in the first week of launch. There are some nice features including Knock Knock, which lets you preview callers before you decide to pick up. You can also benefit from high video quality over wi-fi and the fact that it takes just seconds to begin a call. It's a major triumph for Google, and should give FaceTime and Skype a run for their money.

## Better Security

Android Nougat is also addressing security concerns by providing a more secure experience. Software updates on some devices will download in the background, allowing you to keep using the app while the update does its thing, and the new OS introduces file-based encryption. Even better, Android is now looking after you personally too. As with iOS, you are now able to add health information that can be used in an emergency – such as your blood type, allergies, medications and whether you're an organ donor or not. You do this by going to Settings and selecting User > Emergency Information. The details you enter can be viewed via the lock screen.

## To The Future

That's not all. The Vulkan API graphics system will allow for better gaming performance. So, as long as you have a device which supports it, you should see enhanced 3D graphics in the near future. You may also come to enjoy a new feature called Daydream, which builds a VR platform into Nougat. It's supposed to take virtual reality to another level – certainly more than what is currently possible with Google Cardboard – but it will only work with Daydream-ready phones so you'll have to check if yours works when the feature launches later this year.

So what now? Well, all that remains is for you to actually get hold of Nougat. The new OS was made available first on the Nexus 6, Nexus 5x, Nexus 6P, Nexus 9, Nexus Player and Pixel C, but if you have one of these handsets and can't see the software update, then you should force it by opting into the Android Beta program ([www.google.com/android/beta?u=0](http://www.google.com/android/beta?u=0)). You can also flash a factory image to your phone if you know what you're doing (go to [developer.android.com/studio/index.html](http://developer.android.com/studio/index.html)). Otherwise, sit tight. Nougat will be making its way to various handsets over the coming weeks and months. [mm](#)

# Linux: From A-to-Z

**David Briddock** kicks off this new series with the letter **A**

**T**his week we'll begin this A-to-Z of open source by talking about Android, audio software, the 'awk' utility and the 'at' command. Let's Tux in!

## Android

Quite a few popular operating systems are built on Linux. Yet very few consumers are aware that there's a Linux kernel lying hidden underneath the user interface covering it. By far the most successful example is Google's Android operating system. Launched in 2007, today over 1.5 billion mobile devices are powered by Android, including smartphones, tablets, smartwatches and other wearables.

“ While Linux may not have conquered the PC desktop, thanks to Android it has taken the mobile world by storm ”

Linux ensures Android can be ported to a wide range of 32-bit and 64-bit CPU-powered devices, and that it can take full advantage of its resident graphics processor. It also means Android incorporates a wide range of networking capabilities, has a tried-and-tested security sub-system, and offers support for over 70 languages.

So, while Linux may not have conquered the PC desktop, thanks to Android it has certainly taken the mobile device world by storm.

## Audio

In the early years of Linux development open source multimedia software capable of handling audio format files was rather thin on the ground. Thankfully these days it's a very different picture. Today there are scores of high-quality Linux apps for audio playback, composition, and editing, plus a range of musical performance tools including synthesisers, samplers, sequencers, and even DJ systems.

One of the best known audio editing packages is Audacity ([audacityteam.org](http://audacityteam.org)). Over the last 16 years this open source project has steadily gained stability and functionality, which now includes a sophisticated set of sound analysis, transformation, and multi-track mixing tools, plus many built-in filters and effects. The latest incarnation handles WAV, AIFF, MP3, OGG Vorbis, FLAC, AC3, WMA and ACC file formats.

## Awk

The 'awk' command is a little-known but extremely powerful tool for filtering information and generating reports within Linux.

Many command line utilities generate output in the form of rows and columns. For example the 'ls' directory listing command. Consequently 'awk' is designed to easily process the data contained in these rows and columns.

In overview 'awk' commands apply one or more actions to a data pattern. This makes awk similar to the 'sed' command, but far more powerful in its range of use. Typically 'awk' statements are contained within a hand-crafted shell script for convenience and repeatability.

You can see the usage syntax by typing 'man awk' at the command prompt, but to really get to grips with it and understand its true potential you need a good Linux (or UNIX) reference book to work through. Incidentally, the unusual name is derived from the surname initials of its three creators, namely Alfred Aho, Peter Weinberger and Brian Kernigham.

## At

User controlled task and job scheduling is a common requirement in any operating system. In the Linux this need is addressed by the 'at' command, which executes pre-defined commands at a specified time.

The 'at' command prefixes a Linux batch process. This could be just a simple command, or a shell script file containing a series of commands. One example would be to schedule a file backup process at – say – midnight every day.

The date and time specification parameter options are many and varied, which enables the 'at' command to cope with scheduling one-off and multi-repeated events in intervals that range from minutes to years. To find out more type 'man at' at the command prompt to see its usage syntax. **mm**





# Your Letters

## Non-Windows 10

I give up! Five times I've tried to 'upgrade' (bit of irony there) to Windows 10.

My computer is okay. The downloads go okay. The installation goes okay. Then, when it reboots all I get is a feeble looking blue logo - and nothing else.

When reset, I get the usual Windows 7 log in and then a snotty notice saying the upgrade (that word again) has failed.

A fault code referring to blah, blah lots of 9's, 1's and 0's does not help. As time has now run out for a free lump of download Windows, do you think Microsoft would send me a nice disc with it on? Well it wasn't my fault was it?

Anyway, great mag - but more real PC stuff, please. Getting bored with mobile phones that can't leave a charging point for more than a couple of hours and other bits of kit that make you walk into lampposts.

**Ted Drury**

## TV Detector Vans

Your article in Issue 1428 implies that TV Detector vans didn't actually do anything, but I beg to differ.

I was under the impression that they were equipped with ex army communications receivers with loop aerials, and could pinpoint the 10,000 Hz line timebase signal that was internally generated by old style 405 line valve TV sets.

As a child in the 60's, I recall such sets emitted a high pitched whistle, and the screening of the line timebase generator was a compromise between cooling the big valves in such sets, and trying to screen the HF emission of the line timebase output transformer.

Such emissions could be easily picked up by a sensitive set as described above, and the loop aerials could pinpoint a house with a set in use.

Of course, the BBC would never admit this for reasons you mentioned in your article - but once you know, it's fairly obvious.

Regards,

**Andrew S Redding**

## Pi2 Mate

I've been running MATE in a Pi2 for six months or so. It's been reliably stable as my main internet machine with some office work thrown in. The Pi is velcroed to the back of a 22" full-hd tv and has a wireless mouse and keyboard all running off the TV's usb socket. I live on a narrowboat, so the low energy consumption of the pi really helps (I measure the combined power of the TV and Pi combined as 18W).

**Dave Parry**

## 64GB USB3 Drives

Readers may have noticed Mark Pickavance's review on p66 of Issue 1426 regarding the new Lexar S45 64GBUSB3 'plug-and-stay' Flash drives, but may not appreciate that they are about 3% larger in capacity and 10% faster than SanDisk UltraFit 'plug-and-stay' devices with a more visible activity LED.

Created 'BrucesWay' with a 10GB 'hidden' partition housing a more-friendly-than-Windows10 64-bit, ext4 LinuxMint17.3 MATE system, their 'visible' '53B' FAT32 partition also contains

my entire AudioCD collection as 160Kb/s VBR MP3s, plus a lot of other useful files - which include a 1.1GB suite of PortableApps for Troubleshooting Windows PCs.

The resulting devices are surprisingly compatible with other USB-bootable PCs, quickly adapting together with

ownership change and thanks to their GRUB2 Menu very usefully controlling host PC sessions (their creation and subsequent replication is not for the Linux-illiterate and has been hampered by editorial failure to advise on magazine-preferred file formats).

**Bruce R**

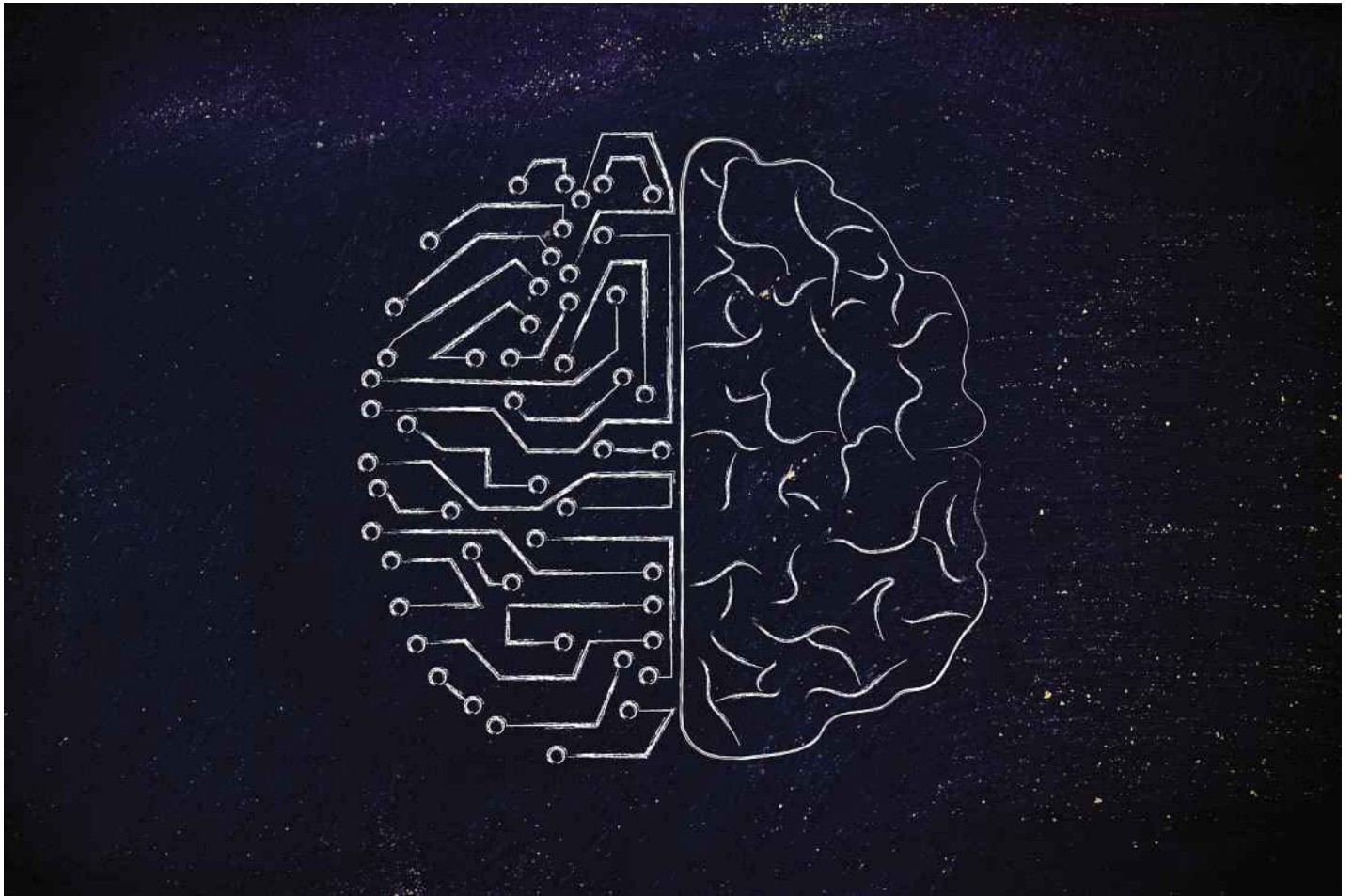


## GET IN TOUCH...

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# Are We Ready For AI?

**Mark Oakley** considers AI's role in our future and wonders if that might be a problem?



**A**rtificial intelligence has been a rich mine of science fiction stories and movies over the years. Most recently, the film *Ex Machina* showed a chilling vision of what an AI robot could look like in a near-future environment. The prevalent theme of these stories is almost always the same: is artificial intelligence a bad thing? Obviously, it makes for better narratives if we believe that AI could run amok – robotic armies take on their human counterparts, AI-enabled homes lock up families, or computers bring down the global economy – but how much of that is just good storytelling, and how much should we really worry?

### Autonomous Driving

Probably the most obvious high-profile example of how artificial intelligence is currently being tested across the world is in the field of autonomous vehicles. You've probably read stories about crashes involving Tesla and Google cars over the past year or so, and it's only natural that we should be skeptical when thinking about seeing these cars all over our roads over the coming years, but should this even be something we should worry about anyway? Are autonomous cars really going to become mainstream?

A report from IHS Technology predicts that the number of AI systems used in infotainment and advanced driver assistance systems will jump from seven million in 2015 to 122 million by 2025. If this is true, while not mainstream adoption, it's certainly going to be a significant level of usage within a decade.

Tesla's CEO Elon Musk has made some comments recently on where he sees the future of AI lying in autonomous vehicles and he's clear that it's the software, not the hardware, that will prove the bottleneck to any future developments. During an earnings call with analysts, Musk said: "Full autonomy is really a software

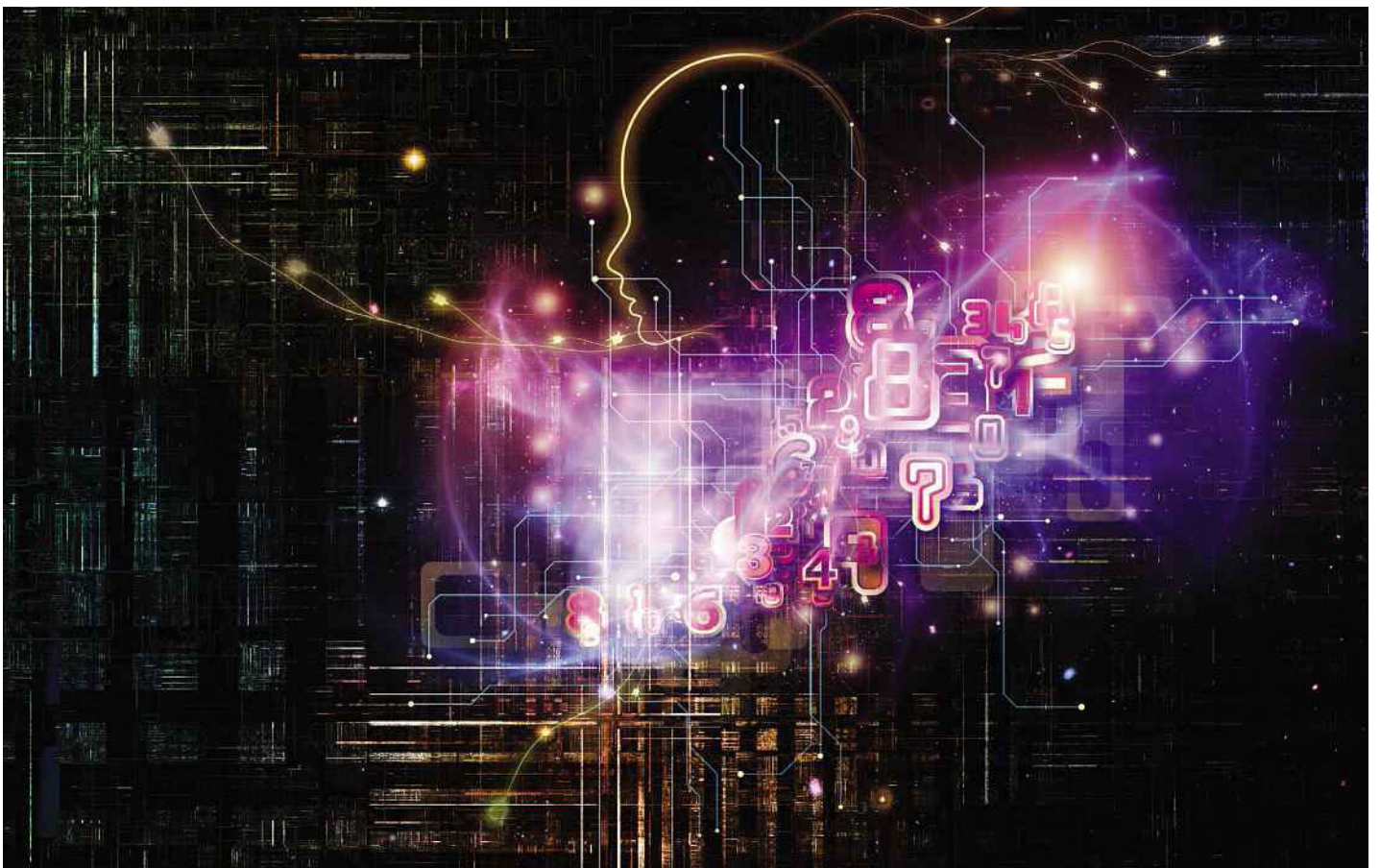
limitation... the hardware exists to create full autonomy. So it's really about developing advanced narrow AI for the car to operate on." He continued: "I want to emphasize narrow AI. It's not going to take over the world, but it has to be really good at driving a car."

With Musk's own views on the scope of AI clear, I think it's fair to state that this isn't a guy who is going to let AI loose on his own autonomous cars until he is 100% sure that it is ready. Indeed, Musk is so interested in the scope of artificial intelligence

**“ It’s the software, not the hardware, that will prove the bottleneck to any future developments ”**

that he has joined other partners from Silicon Valley for non-profit project OpenAI, a \$1bn commitment to support research into AI.

Away from the high-profile work of Tesla, Volvo and Uber have just announced a partnership to work together on self-driving technologies, while Ford's recent announcement that it will produce a fleet of driverless cars for ride-sharing services within five years is also further proof of how seriously the industry is currently taking the prospect of driver automation. Indeed, Ford's president and chief executive Mark Fields said in a speech that the next decade would be "defined by automation of the automobile".





I don't know about you, but the idea of putting a computer in charge of my family's life doesn't sit easy, certainly not right now. The problem with self-driving cars is that even when driving is merely being 'assisted' by a computer, it's human nature to then disengage entirely. The more the car system's AI proves itself to be capable of driving without incident, the more the human driver will allow it to take over the journey – which surely spells trouble.

## Google DeepMind

Google, unsurprisingly, is particularly involved in AI, cementing that interest when it bought UK AI start-up DeepMind Technologies in 2014. Google paid over \$500m for the company at the time, which was one of its largest European acquisitions and demonstrated just how seriously it was taking the concept of deep learning.

DeepMind was just one of several AI-focused acquisitions Google has made in recent years, the other most notable one being the acquisition of Nest, the learning thermostat, alarms and security camera company. DeepMind was definitely the most interesting, however, given the company's work in developing algorithms that are capable of self-learning through "raw experience or data".

Why was Google interested? Given that it had already bought robotics firm Boston Dynamics, DeepMind would seem a natural fit. That's probably for the future, though. For now, Google has used DeepMind to bring efficiencies to its data centres, cutting energy use by 15% by using AI that was more efficient than human control. Google also has its foot in the self-driving world, and DeepMind's algorithms surely have a potential there.

Most recently, DeepMind was co-opted into Google's AlphaGo project that surprisingly beat Lee Sodol, one of the world's best human players of the board game Go, by four games to one in a recent head-to-head. One of the reasons Go was chosen for the experiment is because it has more possible positions than there are atoms in the universe, according to DeepMind, and is apparently regarded as a tough challenge to crack. As such, the AI's victory was regarded as a major step forward in how such technology can adapt to the world around it.

Looking at it objectively, AI is quite probably Google's most interesting project right now, with potential to underpin much of its business and projects. The firm is listed as second in *Forbes'* list of the world's most valuable brands, so it will surely play a crucial role in our interaction with AI whether we like it or not. The company is aware of its responsibilities in this regard, and has written about the potential negatives of artificial intelligence with five 'research questions' to bear in mind.

The five points, which use the example of a cleaning robot, are: avoiding negative side effects (ensuring the robot doesn't disturb its environment in a negative way); avoiding reward hacking (ensuring the robot doesn't cut corners to get its rewards); scalable oversight (how can the robot respect aspects of the objective that are too expensive to be frequently evaluated during training); safe exploration (ensuring the robot performs its tasks in a safe way); robustness to distributional shift (ensuring the robot behaves robustly in different environments to its training one).

While, in this particular case, the repercussions of failing on one of the five points would result in a workforce coming in the next day to a complete mess, computers fried from over-



mopping and paper files strewn around, these five points can be considered more broadly across AI projects. For example, what if an AI-enabled robot is being used to help with medical procedures or plot a course for an aeroplane? To be truly successful, artificial intelligence will have to be able to be implemented without the need for active intervention of a human operator.

## The Next Big Thing?

How did artificial intelligence become the focus of the next giant leap in our evolution anyway? The idea of interconnected technologies, all talking together to help bring opportunities and benefits to our lifestyles, converging existing technologies to achieve common goals and solve problems mere human beings cannot, has become something of a Holy Grail for technology companies like Google.

One of the key reasons for this is because a global brand like Google wants to have an active say in your life. If a company can somehow be involved, whether you realise it or not, in your decision-making in your everyday life, it can make money from those decisions. It can make money from developing relationships

“ Any critical AI system will need to be able to monitor itself continually to detect abnormal behaviour that could be a sign of a cyberattack ”

with the suppliers you deal with, just like it makes a lot of money from being the primary search engine of choice for the world. With all of the information already at its disposal, doesn't it make sense that Google would want to leverage that data in other ways?

Apple is another global company with one eye on artificial intelligence. In a recent investor's call, Tim Cook said that the company is looking into the possible adoption of machine-learning across Apple's products and services, including recommending songs and apps to users, the end result being a 'better' customer experience that's more tailored to what we want. In terms of recent investments, Apple has bought UK-based VocalIQ, an AI-based company developing software that makes for more natural interactions between robots and humans. This acquisition was seen as a way to improve Siri's own understanding.

Apple has also recently bought Turi, a Seattle-based machine-learning start-up that could also help Siri to be a better, faster learner – and potentially an assistant that could be rolled out into other Apple products further down the line. The idea, in the long-run, is that Apple's users will increasingly use Siri to help them make decisions, feeding AI with the necessary information on their thoughts and desires so that it can then help us make the right moves. You can view this involvement in your decisions as either a very helpful thing, or completely intrusive. It's all about perspective.

Google and Apple are just two major companies looking at AI possibilities within their future, and their scope and global strength could make them important drivers in artificial intelligence. Companies like these have a big responsibility on their shoulders. Thankfully, there are organisations out there that are watching their progress.

## Benefits Vs Risks

The Association for the Advancement of Artificial Intelligence (AAAI) is an international, non-profit organisation committed to research in, and responsible use of, artificial intelligence. In a similar vein to Google's own points of concern in developing AI, those at the AAAI have come up with their own set of risks that those involved in its future should pay heed of.

The biggest worry that they raise, as far as I can see, is one of human error. Ultimately, AI has to start with computer programming and, as we all know, computer programming can go very, very wrong. In a future, AI-driven world, who can guarantee that these crashes and glitches won't happen on a much wider, more dangerous scale? As with Google's robot cleaner example, AI learning will have to be able to cope with something out of the ordinary.

The other legitimate worry right now is cybercrime. Hacking is a fact of life these days, sadly, and any critical AI system will need to be able to monitor itself continually to detect abnormal behaviour that could be a sign of a cyberattack on its operation or a bug in its code. The impact of a cyberattack on AI could have serious consequences, of course, and the past-president of the AAAI Thomas Dietterich has warned in an article that he co-wrote that "Before we put AI algorithms in control of high-stakes decisions, we must be much more confident that these systems can survive large scale cyberattacks".

He also stated that an AI system must be able to work with human beings and not go rogue – "They must know when to stop and "ask for directions" – and always be open for feedback". This idea of AI outgrowing its human makers is a well-worn one in science fiction and, clearly, the science fiction vision of a world in which the robots have taken over is just that, a fiction. However, we must all surely pay attention to this final warning from Dietterich's rather foreboding article: "we must not put AI algorithms in control of potentially dangerous systems until we can provide a high degree of assurance that they will behave safely and properly".

The worries surrounding AI are very real and I'm sure the companies involved in AI are not ignoring them. One thing is certain: artificial intelligence is very much a reality. This is no longer science fiction. [mm](#)

## Will A Robot Take My Job?

An understandable worry about AI is that human beings could be about to lose their jobs to robots installed with artificial intelligence. This would be a natural development from the automation of many tasks within manufacturing industries and the adoption of computer systems in what were previously human-based roles.

This fear appeared to have come a step closer in the US recently as a retail store in Palo Alto, California became the first in the country to use the interactive robot, Pepper. Pepper has already been used as a receptionist in a couple of Belgian hospitals and some restaurants in Asia and it is particularly interesting as Pepper can 'read' emotions. In the retail space, it could potentially be used to help shoppers make buying decisions, in the same manner as a traditional retail assistant asking you if they can help you with your purchase today.



# Giffgaff

## A Publically Run Success Story

**Just how has the crazy mobile phone network managed to flourish in the face of larger opposition?**

**T**he mobile phone market isn't an easy nut to crack. With so many different providers in the market, it's tough for buyers to make the right choice and even tougher prospect for new companies to break into. It's difficult to offer anything new that'll stand out from the busy crowd, and the fight for people's money is fierce. It's impressive, then, that the unorthodox giffgaff has become so successful. How did it manage this? Let's have a look.

### Original Origins

Any business takes a lot of capital to start, and anyone planning to get their own operation off the ground has many concerns to address and complicated finances to sort out. Some businesses

are more complicated to set up than others, of course, and there could be all sorts of issues that face some that don't phase others. Businesses in the IT industry often have many specialised barriers to entry, with the technology behind it being an early hurdle.

Luckily for giffgaff creator and Chief Executive, Mike Fairman, this was a barrier that didn't present too many issues as he had the O2 network backing him and his new company up. Giffgaff is actually a subsidiary of O2, a company Fairman has long been involved with. Thanks to its existing technology, giffgaff's creation was much less painful than it could have been. That was just the start, however.

Giffgaff was always intended to be a different kind of service, one that was far removed from the other MVNO (Mobile Virtual Network Operator) competition. Costs were a focus, and Fairman wanted



# giffgaff™

The mobile network run by you



▲ *Giffgaff is a mobile network that's different from the others*

▲ *Mike Fairman is the CEO and man behind giffgaff*



▲ *Giffgaff has risen to become one of the most popular service providers*

to offer a service that was not only competitive with the existing alternatives, but was even better in terms of affordability. In order to facilitate this, a new approach was needed, one that would allow the company's prices to be lower than the competition, whilst retaining the same level of functionality and overall quality. The answer to this conundrum lay in its overheads.

“ The answer was simple, even if it was a huge gamble – let giffgaff's customers do it ”

One of the biggest costs business owners have to deal with stem from the underlying upkeep of any company – facilities, bills, supplies and, importantly, staff wages. All money made by any business is divided up to pay these various overheads before any profit can be considered – and there's only so much you can shave off this before you start to have a negative effect; or is there?

This is where one of the major features of giffgaff comes into play, and the underlying reason the company has been so successful. It was decided that giffgaff wouldn't operate as a normal mobile phone service provider. Instead, it'd ditch much of the usual infrastructure, including call centres, a staple of the business. This would eliminate premises costs, utility bills, and staff wages, a saving that could be passed on to the customer in the form of cheaper tariffs.

Without call centres, though, how could giffgaff operate? After all, there'd be no support, traditional sales departments, or anything else that you'd usually find making up a successful business. The answer was simple, even if it was a huge gamble – let giffgaff's customers do it.

## DIY Phone Co.

Fairman and his team came up with the idea of allowing giffgaff customers to run the company themselves, well, kind of. The company would be run by actual staff, but aspects like support and even some sales would fall on the customers. Giffgaff's online presence would be paramount, and the forums would serve as the call centre. Here, giffgaff members would be able to help others with any problems they may have, and members could even recommend giffgaff to others, providing SIM cards. All of this community spirit was to be rewarded with monetary incentives, and just by providing some help to others on the forums, people could potentially earn money.

The 'PayBack' scheme provides members with points that can be turned into cash, or PayPal payments. The more help a member provides, the more cash they can earn. The forums and support are fully policed by giffgaff customers, with answers to questions being voted on as suitable, and the whole community works together to provide one of the most helpful support

## Goodies

As a mobile phone service provider, giffgaff has a range of packages for many users, and these make the most of its pay-as-you-go focus. Instead of simple top ups, however, the company offers 'goodybags' that come in various forms.

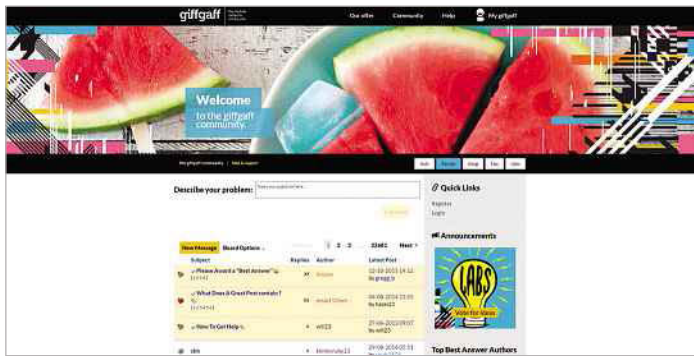
These range in price from £5-20, with each including data, talk time, texts and free giffgaff-to-giffgaff calls and texts. These packages are more flexible than many similar PAYG services and, should you wish, you can even set up an automatic renewal so you get the benefits of a contract service with auto updates, but are not shackled by an actual contract. Nice.

Giffgaff also offers data-only 'gigabags' for users who simply need to access the Internet, and don't actually want to buy talk time. This is perfect for devices like the iPad.

Gigabags are cheaper than goodybags, and can be purchased in 500MB and 1GB varieties, and the rest of the normal goodybags also provide a lot of data, with limits of up to 6GB for the usual, packages, or an unlimited always-on option for £20. This provides unlimited data but does utilise a fair use policy with traffic flow monitoring, and the reservation of giffgaff being able to disconnect users as it sees fit. This was the cause of some controversy due to misunderstanding, after which giffgaff made the rules more clear.

► *Giffgaff's range of top-ups cover all users, including data-only*

Price per month	For 1 month	For 3 months	For 6 months	For 12 months	Free to giffgaff numbers	Select
100+10	125	340	Free to giffgaff numbers	Select		
300+10	210	Unlimited	Free to giffgaff numbers	Select		
1GB	300	Unlimited	Free to giffgaff numbers	Select		
2GB	380	Unlimited	Free to giffgaff numbers	Select		
2GB	500	Unlimited	Free to giffgaff numbers	Select		
4GB	1,000	Unlimited	Free to giffgaff numbers	Select		
4GB	2,000	Unlimited	Free to giffgaff numbers	Select		
Always On	Unlimited	Unlimited	Free to giffgaff numbers	Select		
300+10	-	-	-	Select		
1GB	-	-	-	Select		



▲ Giffgaff's beating heart has to be its user forum, the place where members consult and help each other

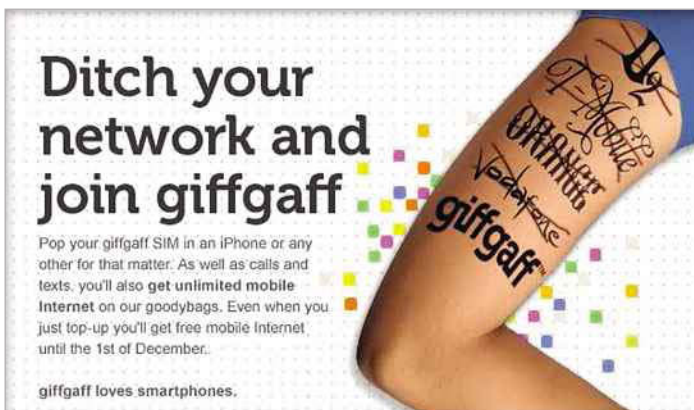
systems we've seen. It certainly beats waiting on the phone talking to automated machines. The forum is also fast, with questions usually being answered in only a few minutes.

This self-service concept turned out to be very popular, and giffgaff quickly built up a loyal user base. The focus on a customer-run business was clearly working, and it would only expand – in ways few other companies would consider.

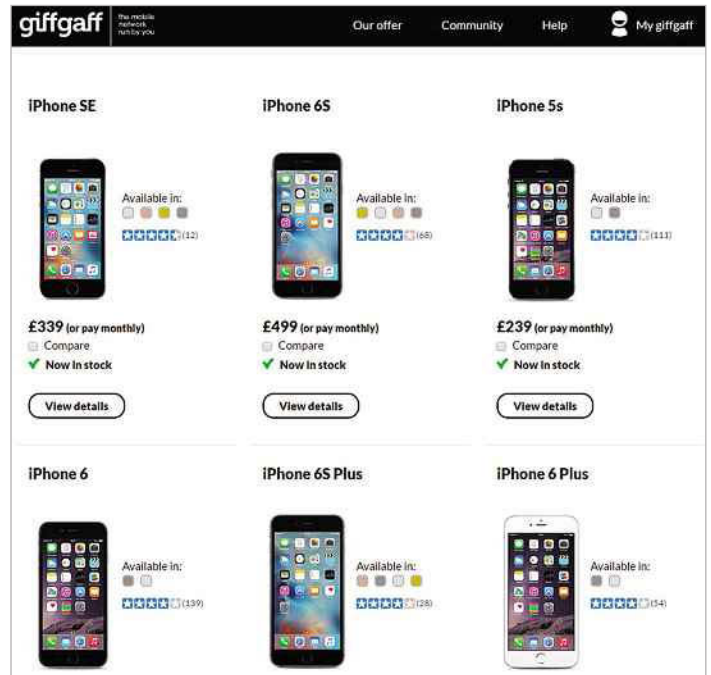
Giffgaff members were able to shape the company in very real and literal terms. According to reports, customers have suggested thousands upon thousands of ideas, which giffgaff has actually acted on. Around 10% of suggestions have been taken on board and put into action, making the company an ambassador for customer feedback if ever there was one.

This loyalty has even worked on behalf of the company in ways even Fairman couldn't have foreseen. For example, in an interview with *The Telegraph* ([bit.ly/1TLWwhN](http://bit.ly/1TLWwhN)) he mentioned an issue that faced the company when Apple's iPhone 4 introduced the smaller, micro SIM card. Some enterprising giffgaff members actually purchased a hand stamping machine that could cut down larger SIMs into the smaller format. Fairman forwarded requests for smaller SIMs on to the members, who ran the site Microgaff, and then processed the SIMs for others. This allowed giffgaff to supply the micro-sized SIMs months earlier than it could itself whilst the required micro SIMs were manufactured.

The amount of money members can earn is quite astounding too. In the same interview, *The Telegraph* also cites an example of a giffgaff member, or 'gaffer', making £13,000 simply by handing out giffgaff SIM cards in his grandfather's corner shop. That's quite the chunk of change, and it benefits both members and giffgaff. It's just another example of how well giffgaff's approach to working with its customers really works. There's a



▲ Giffgaff's ads have often courted controversy, but it hasn't stopped its name from spreading



▲ Apple's iPhone is available through giffgaff

reason giffgaff has its name, after all. It's a Scottish term that means 'for mutual benefit'.

It's this mutuality that's arguably been the single most important element in giffgaff's success, and something that even Fairman himself doubted was possible. "I'm amazed that it worked," says Fairman, "when we started, we were worried about the fact that we were a mobile phone operator that didn't have a call centre, it all sounded a bit bonkers."

Not many others would argue with him at the time, and on paper, giff gaff's structure and its emphasis on its customers is very different from any other telecoms company. Many were adamant that this approach couldn't work, but time has revealed this to be an incorrect assumption, and giffgaff has become one of the leading MVNOs on the market.

O<sub>2</sub>

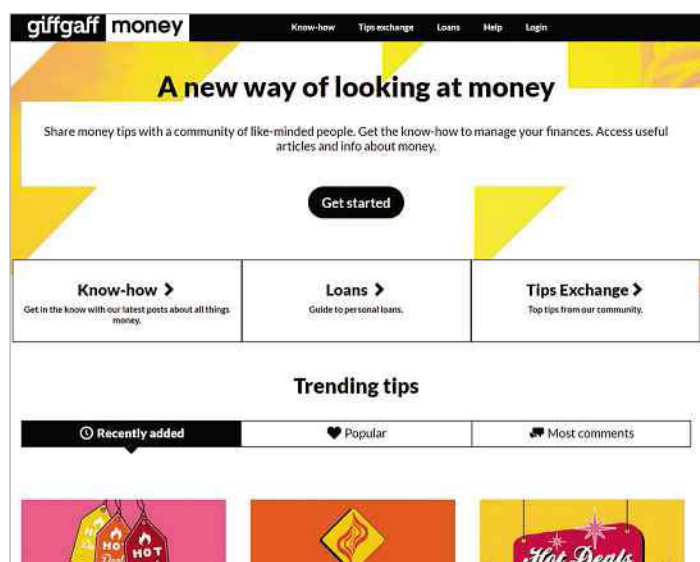
► O2 is the parent company of giffgaff, and is in turn owned by Telefonica

## Know The Limits

One of the reasons giffgaff is so popular amongst users are the 'free' services. When you top up your phone you're awarded free calls and texts to other giffgaff numbers. There are limits to this offer, however, and it's handy to know about these (the main site hides them away quite well).

The free services are offered for up to three months after a top up, and the actual calls are limited to 60 minutes. After this, you'll have to pay whatever the normal rate is. The three month period resets when you top up again, but usage doesn't carry over, so any unused minutes will be lost.

The free services are not viable if you're using roaming, such as using your phone abroad. In these situations, you'll incur the usual costs, so be careful, and don't rely on the free calls and texts in these situations.



▲ P2P loans are available via giffgaff, as well as a mass of money advice



▲ Super Recruiters are paid for bringing in new giffgaff members

## Giffgaff For Sale?

Back in 2015 the future of giffgaff was uncertain as the owner of 02, Spanish telecoms company Telefonica, was planning to float or sell giffgaff's parent company due to a large build up of debt. Reports measured 02's debt at around £42 billion, and plans were put into place to sell it to competing mobile provider (and another UK firm run by overseas interest, this time the Hong Kong-based CK Hutchison), 3, for a cool £10.25 billion. 3 didn't manage to clinch the deal, however, and it fell through.

Following this, Telefonica approached various other parties, many of which were funded by private equity, dropping the price to around £8.5 billion. These plans were taken very seriously, and were ongoing until external events promoted some backtracking.

These external events primarily included Britain's exit from the EU. In the wake of Brexit Telefonica's financial advisers concluded it would be a mistake to offload the company in such troubled times. This was probably a very wise decision.

## Strength To Strength

Despite any troubles with its parent companies, giffgaff, the "network where members are in control" has continued to grow and evolve, and has over time even managed to secure Apple's iPhone as an official carrier.

In fact, the company has also recently expanded into other areas entirely with giffgaff Money. This contains money saving

information, tips, and tricks from the giffgaff community, further making the most out of the company's novel approach.

Alongside the advice element of giffgaff money comes the rather unique 'P2P lending' concept. Working with Ratesetter, it allows lending of funds to giffgaff members, with the loan initially functioning as a way for those with limited funds to acquire a new phone. Now, however, these loans can be taken up for anything customers like. Best of all, it doesn't rely on banks and other institutions that the general public struggle to trust, and doesn't have any 'hidden' or 'unreasonable' charges.

## The One For You?

Giffgaff has established itself as a worthy alternative to the competition and, thanks to its unique community spirit, is now one of the more respected providers around. The appeal of the service is fairly obvious, in that it's a contract-free mobile phone option that has some great top-up deals and a wide range of phones, including the iPhone, all of which are unlocked. The lack of a call centre or traditional support may not be for everybody, but as it's all online in the forums, it's easy to research and try out ahead of time, and you can get a good feel for the community who are always on hand to help.

Should you want to get involved, it's also a way to earn your own money, and there's also the chance to become what the company calls a Super Recruiter. This primarily involves recruiting

“ The appeal of the service is obvious, in that it's a contract-free mobile phone option that has some great top-up deals and a wide range of phones ”

new members to giffgaff; once you pass 15 new recruits you earn the title and Giffgaff then pays out cash – either in the form of PayBack points or via PayPal. Even some forum users have reported making money from helping others, certainly enough to pay for goodybags, meaning their giffgaff service pays for itself.

If all this crowdsourced expertise appeals to you, and you're looking to move away from your current provider, you should visit the site and check it out. [mm](#)

## Award Winners

Giffgaff has risen to join the best mobile phone services despite taking a radical approach to its business, and this has been recognised by the industry in the form of various awards. The company has taken home both the Forrester Groundswell and Most Innovate Community awards, which it won in its first year of operation, and since then has also won other accolades, including *Which?* Magazine's Best Telecom Services Provider, and the Best MVNO, which it bagged from the Mobile Industry Awards in 2012. Those are some impressive awards for a company that doesn't even have its own call centres, and this only proves that the power of a loyal and rewarded community can be immensely effective.





## Apple 1 Sells For \$815,000

That's a lot of money,  
even for Apple hardware

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# Apple Ordered To Pay Up

### EC rules on tax

**T**he European Commission has spoken. Having accused Apple of paying far too little in taxes, thanks to Ireland granting it “undue tax benefits”, the EC has now ordered the country to recover up to €13bn in taxes, plus interest. Ouch.

This not-insubstantial sum covers a period between 2003 and 2014, with the EC having laid the seeds for this action in 2014 when it first began its investigation. Competition commissioner Margrethe Vestager was pretty damning in her statement, saying “Member States cannot give tax benefits to selected companies – this is illegal under EU state aid rules. The Commission’s investigation concluded that Ireland granted illegal tax benefits to Apple, which enabled it to pay substantially less tax than other businesses over many years. In fact, this selective treatment allowed Apple to pay an effective corporate tax rate of 1% on its European profits in 2003 down to 0.005% in 2014.”

She has also made it clear that this is in no way a fine for Apple. This is money that the EC deems the company is patently responsible for paying up.

As you might expect, Apple is looking to appeal the decision, calling the decision an attempt to “rewrite Apple’s history in Europe”. This is, without a doubt, a significant moment for big business, though. That €13bn is a big sum – one that Apple can afford to pay, certainly, but a big figure all the same.



So another ancient Apple 1 system has sold at auction, recently and this time the figure being shouted out when the hammer went down was an eye-watering \$815,000.

This particular model was extra-special due to being pre-production prototype, which marks it out as being a particular rare example of what is already a pretty rare machine. By all accounts, an Apple employee first owned this prototype before selling it on in the late 1970s.

Ironically, that large amount of money was actually something of a disappointment. In

advance of the auction, the press was told that the rarity of the model was expected to push the auction above the \$1m mark. Although it didn't quite manage those heady heights, we'd still reckon that final bid would not be a cheque to be sniffed at.

Apparently the competition for the system was pretty stiff, with around 80 bidders interested in getting their mitts on it. However, in these austere time, it failed to become the most expensive example of an Apple 1 system either. A working example of Woz's baby sold for \$905,000 at an auction in 2014.



The summer holidays are now over, and by the time this issue appears on shelves, September will be well under way. Whether you're a student or the parent of one, you'll likely be looking at the latest tech, searching for a PC to make the learning process easier, more convenient or even more fun.

Your options are plentiful. A cheap notebook with a decent-sized keyboard is all most students really needs. A Chromebook, for example, would be ideal, offering word processing, spreadsheets and web access. Only limited gaming would be possible, but the fewer distractions the better, surely? A Raspberry Pi could also be sufficient for a lot of students, as long as they have access to a monitor, keyboard and mouse.

Both of these options could help save a few pennies – a major concern for many students. But you could save even more if you already own a tablet or smartphone. A simple Bluetooth keyboard could turn a tablet into a makeshift laptop, and with an HDMI adapter, you could easily plug a phone into a monitor and turn it into a portable work system.

No matter what your budget, then, there should be something you can afford. And even if you're not a student, you might still benefit from some of the great deals available around this time of year.

*Anthony*

# Edifier Adds To Speaker Range

**'Thumping bass' on portable model**

Audio systems manufacturer Edifier has launched the latest in its speaker range catering specifically for the outdoor market: the Kaleidoscope MP 280.

Its cylindrical, reflective design produces what Edifier calls "perfect 360°" all-round sound featuring professional-grade audio Digital Signal Processing chips and a passive bass radiator for "thumping bass". The Kaleidoscope MP 280 uses the latest Bluetooth 4.0 technology for wireless

connection to a phone with playback at a distance of up to 10m (32ft in old money), while battery life from the long-lasting lithium-ion battery produces up to 10 hours of playback, hence why it's being billed as great for outdoor use.

The £80 speaker is made from hard-wearing silicone material and, as you can see for yourself, has a rather neat, minimalistic button design in red, blue or black. You can read more at [www.edifier.com](http://www.edifier.com).



# Meanwhile... On The Internet...

**T**he of Team Meanwhile...s favourite meme is 'Not All Heroes Wear Capes', we use it all the time – not least when we are tossed the keys of the [@micro\\_mart](https://twitter.com/amicro_mart) Twitter account (like this: [tinyurl.com/MMnet30a](https://tinyurl.com/MMnet30a); and this: [tinyurl.com/MMnet30b](https://tinyurl.com/MMnet30b)). It's a line often added to images or videos of ordinary people doing extraordinary things – or totally ordinary things that really help someone out. It's a phrase that could equally be applied to a great innovator, the guy who delivers your pizza when you're absolutely starving, a great catch in the crowd during a cricket game, the dyno-rod guy, or your favourite barista. It's a universal sign of respect, we guess. The best application of it, though, is in honour of something outlandishly roguish in nature – something a bit like the story we read regarding the Sri Lankan schoolboy who appears to have decided that the best way to get out of his exams was to hack ([tinyurl.com/MMnet30c](https://tinyurl.com/MMnet30c)) the website of his country's president, Maithripala Sirisena ([president.gov.lk](https://president.gov.lk)).

The 17-year-old boy (though his name is being kept from public consumption, protecting his youthful anonymity, press reports seem to agree it was a male) from Kadugannawa (that's just west of Kandy, if you were wondering: [tinyurl.com/MMnet30d](https://tinyurl.com/MMnet30d)) was allegedly part of a group calling itself Sri Lankan Youth, which defaced the site on two occasions with messages calling for the dates of exams to be put back, ostensibly because of a clash with celebrations with the Sinhala and Tamil New Year celebrations ([tinyurl.com/MMnet30e](https://tinyurl.com/MMnet30e)). The missives left on the site then went on to criticise the cybersecurity measures of the government, and make several other threats and demands. Joking aside, it is currently unclear whether the protest was a genuine political statement or just a spot of pragmatism from a struggling student. For the sake of our intro, we sincerely hope it's the latter.

On another serious note, it's pretty easy to make light of a story like this, and cast it as something akin to *Ferris Bueller*- or *War Games*-esque shenanigans by rambunctious kids (that Broderick was a wag: [tinyurl.com/MMnet30i](https://tinyurl.com/MMnet30i)). However, in a country that has been divided by a bloody sectarian civil war that lasted for the best part of 30 years, and which only came to its controversial end during the tenure of Mr. Sirisena's predecessor, Mahinda Rajapaska ([tinyurl.com/MMnet30f](https://tinyurl.com/MMnet30f)), this kind of thing is likely to be looked upon in much more serious light. In fact, the boy arrested could be looking at three years in prison and a substantial fine. Not so funny now, eh?

Of course, in a totally un-shocking nothing-is-original-anymore piece of Googling, we discovered that this lad's not the first to turn to threatening cyber-messages in the hope of getting out of an exam ([tinyurl.com/MMnet30g](https://tinyurl.com/MMnet30g)), or to turn to hacking to better his chances at school ([tinyurl.com/MMnet30h](https://tinyurl.com/MMnet30h)). Trope-tastic!

## .AVWilder...

**S**o, 2016 shows no signs of not being utterly awful any time soon, then? While we're aware of the cultural phenomenon ([tinyurl.com/MMnet30p](https://tinyurl.com/MMnet30p)) that dictates that someone we like for their acting, singing or other talent will pass away quite regularly these days, this year does seem to have been incredibly cruel. Last week, we noted the passing of Gene Wilder, a man who will forever be the meme-worthiest Willy Wonka, and preserved in all his glory (we hope) as one of the funniest screen actors of all time. To wit: this fantastic video, edited and posted to Vimeo by Rishi Kaneria that beautifully highlights his gift for comedic pauses ([tinyurl.com/MMnet30q](https://tinyurl.com/MMnet30q)).



**W**e've all seen one. Heck, some of us probably have a great one of our own that we can whip out when we need it ([tinyurl.com/MMnet30j](https://tinyurl.com/MMnet30j))... We're talking, of course, about the look on the face of a disgruntled IT guy (see above). It is something unique: equal parts frustration, anger, ennui, and disdain. It can melt a floppy disk from 20 paces, and is ready to be deployed to unsuspecting users without warning faster than you can say 'cold, manual reboot' ([tinyurl.com/MMnet30k](https://tinyurl.com/MMnet30k)).

It's the face you make when your friends and family ask you to look at their PC ([tinyurl.com/MMnet30l](https://tinyurl.com/MMnet30l)), times twenty... It's that Windows 10 update message feeling squared ([tinyurl.com/MMnet30m](https://tinyurl.com/MMnet30m)). It's in all of us, waiting to be booted up when needed.

Last week, a prime example of, what we can only describe as, 'resting Linux face' emerged from its basement, out into the light and straight into a Reddit photoshop battle ([tinyurl.com/MMnet30n](https://tinyurl.com/MMnet30n)) that saw him re-cast as Rasputin, Comic Book Guy from *The Simpsons*, Hagrid, and many others. It was, in short, everything that's pretty great about the internet – especially the fact that, if you take the time to read the original thread in detail (it's here: [tinyurl.com/MMnet30o](https://tinyurl.com/MMnet30o)), it doubles as a photoshop masterclass, interspersed with Reddit-level humour. What's not to like?





## Caption Competition



"I said watch the birdie,  
I didn't expect it to start  
watching me."

We're not absolutely sure that, when he picked this particular image, our esteemed editor had considered the full range of comic possibilities presented by issue 1428's Caption Competition. Either that, or he just knew he'd be on holiday and wouldn't have to sort through the entries. Anyway... Here's a redacted, safe for work, collection of your humour.

- **Thomas Turnbull:** "They said be a professional photographer to attract the birds, but this is not quite what I intended."
- **Ondrive:** "No, I said our website needed more hits!"
- **Ritasueandbobtoo:** "Here comes my selfie for twitter!"
- **Mad Malc is back:** "You looking at me?!?"
- **Martin Prince:** "How many mega-peck-cels is this?"
- **dudeofblokes:** "So now I know what it means to have a bird's eye view picture"
- **Teafie:** "Chris Packham misses the shot."
- **johnbarry:** "Birds eye view."
- **dudeofblokes:** "Not what we meant by tweet us your best picture"
- **pesukarhu:** "*How It's Made: Donald Duck's Clown In The Jungle!*"
- **dudeofblokes:** "Pwoaaar! I got me a nice close up of some bird"

The winner, though, was CapComp regular Thomas Turnbull, with "I said watch the birdie, I didn't expect it to start watching me". Practice does indeed make perfect!

If you have a caption for picture below, head to the 'Other Stuff' section of our forum (which you can find at [forum.micromart.co.uk](http://forum.micromart.co.uk)), or email us your funniest ideas via [editorial@micromart.co.uk](mailto:editorial@micromart.co.uk). Just remember to add the issue number to the email subject line.



# Facebook Changes Trending



## More automated in future

Having been accused of left-wing bias by Republicans in the US, Facebook has announced that it's overhauled its Trending feature to become more automated in its decision making..

Trending will now use a mixture of AI and human input so news stories and topics are no longer written by editorial staff. Facebook found itself accused of "suppressing"

conservative views and, while Facebook's own internal investigation into the matter didn't find any evidence of this, the company has still decided to act so that its editorial output can't be accused of making personal decisions on topics.

Facebook is putting more faith into machine intelligence here, but the upshot is that the Trending team are now reportedly out of a job.

# Kindle Crashes Windows

## Update borks PCs

If you're an Amazon Kindle owner and your Windows 10 system crashed when you plugged it in, you're not alone. We understand that this is little consolation but at least you know that it wasn't just you.

The issue was reported as being fairly widespread with some Kindle Paperwhite and Voyager owners connecting their devices being greeted with crashed systems in need of a reboot. The culprit was understood to be the Windows 10 anniversary update not wanting to play ball, leading to the BSOD.

Apparently, one workaround is to plug in the Kindle during boot-up or while your system is asleep. Annoying, but a viable solution nonetheless.



## Snippets!

### Fallout Shelter Update

Bethesda's mobile and PC spin-off *Fallout Shelter* ([www.falloutshelter.com](http://www.falloutshelter.com)) has been updated to version 1.7. Content includes new quests and quest types, new objectives to help you earn additional resources, and a Nuka-World-themed mission that, once completed, allows Nuka-World mascots Bottle and Cappy to appear in the Vault. The download's free and if you haven't got into the game yet, now seems like a good time to start.

### Girls Do IT Better

The latest GCSE results revealed that a minority of girls chose tech subjects, with just one-in-five computing entries coming from female students. The irony in this is that girls are outstripping boys in terms of grades, in both computing and ICT, and global tech recruitment firm Empiric wants to see that change. Director Steve Brown said: "When we consider that the IT and digital arenas are facing a massive dearth of skills, the idea that over three-quarters of female students choose not to take ICT and computing at GCSE level is quite simply concerning."

### Dropbox Hack Notice

Dropbox users have been emailed with a request to change passwords. Following a recent dump of data related to a hack back in 2012 that saw users' information stolen. Users who created accounts prior to mid-2012, or who haven't altered their passwords since that time, have been contacted about the reset because of a warning over the emergence of an old set of those user details. If you've had the warning it's probably best that you act upon it post-haste.

# Cloud Data Backup From Acronis

### Latest release of True Image package

Cloud data protection outfit Acronis has announced the latest version of its True Image personal backup software. This 2017 version claims to be the most complete personal data protection around, combining full image, local, and cloud backup for users – with new wireless backup for mobile devices to local Windows computers or the Acronis Cloud. This update also claims to be the fastest full image backup and recovery software for personal use.

You're actually getting a whopping 50 new features altogether, including incremental Facebook backup of an account's content including photos, videos, contacts (even comments and likes), plus archiving of data to the cloud or external storage devices. With a refreshed touch-friendly user interface on iOS and Android devices too, this £30 (subscription for one computer) or £35 (for a one-computer license) package can be spotted at [www.acronis.com](http://www.acronis.com).

# Project Power

### Full tablet/projection system from Aiptek

Aiptek has been in contact to promote its iBeamBlock gadget, an all-in-one modular computer projection system consisting of an HD projector, Windows 10 tablet and battery.

As you can see, the components are stacked on top of each other cordlessly like Lego bricks, with magnets and pogo-pins keeping them securely in place. The projector can be used as a standalone device, offering with a brightness of 400 lumens, a 1280 x 720 resolution, integrated speakers, RGB LEDs and digital light processing technology.

The iBeamBlock will cost £585 and is compatible with Excel, Word, PowerPoint and PDF documents and it can project images up to 120". The 4.5" Windows 10 tablet part of the block has wi-fi, Bluetooth, USB, microUSB and a microSD

interface for quick and easy data transfer and this whole system could easily be used for home cinema, gaming and slideshows.

This is due out any time now and [www.aiptek.eu](http://www.aiptek.eu) is the website for more detail.



# Police Report Pokémon Go Problems

## Incidents just keep on coming

**T**he BBC has reported that UK gamers playing *Pokémon Go* have been responsible for “hundreds” of incidents since the app was launched. The broadcaster issued a Freedom Of Information Act request, and it notes a total of 290 incidents recorded across England and Wales in June with most recorded by the Lancashire Constabulary. The police, of course, has reminded gamers to pay heed to local laws and

to be careful when playing and the incidents variously include reports of fighting among large groups, concerns about luring children into unsafe areas, and gamers trespassing railways.

If you know any younger gamers who are playing *Pokémon Go*, just make sure they’re doing so safely. If you know of anyone playing the game while driving – another common problem, apparently – please give them the requisite rollocking.

# Sony Releases Dualshock Adapter For PC

## PS Now also makes the move

**A**ny PS4 owners that are keen on their Dualshock 4 controllers can now officially use them with their PC or Mac thanks to a USB wireless adapter from Sony.

Released on September 15th, the £20 adapter makes it possible to connect a DUALSHOCK 4 wireless controller and use all of its features – including its motion sensors and light bar – for compatible games. The adapter will also be compatible

with the PlayStation Now subscription service that has been announced for Windows PC, which gives instant access to over 300 classic PlayStation titles streamed straight to your computer. Included among those titles are such beauties as *The Last Of Us* and the *Uncharted* Trilogy.

You can read all about PlayStation Now, which costs £13 a month, over at [www.playstationnow.com](http://www.playstationnow.com), and about the adapter at [tinyurl.com/gpoj9lp](http://tinyurl.com/gpoj9lp).

# Self-Driving Car Takes To Race Track

## Completes lap in public test run

**A** driverless racing car put together in advance of an autonomous racing series has been given a public showing in Leicestershire. DevBot is a prototype being used to help finalise the necessary hardware and software ahead of the planned inaugural Roborace season.

The car is powered by NVidia’s Drive PX2 supercomputer, built for in-car

AI and capable of delivering up to 24 trillion deep learning operations per second. It also obviously uses all sorts of sensors to guide itself around the track.

Fortunately for all concerned, the trial was a success, completing a lap around Donington Park in front of what was likely a fascinated crowd. We’re keen to keep tabs on any Roborace events going forward, so we’ll keep our eyes peeled for more details on that.

# Apple Screens Not Up To Scratch Claims lawsuit

## US class action over iPhone 6 and 6 Plus

**N**ot the biggest legal news surrounding Apple this week, but a class action lawsuit across the pond is calling out the company for not fixing a problem with the touchscreen on some of its handsets.

Specifically affecting the iPhone 6 and 6 Plus, a group of former owners of the handsets has filed the suit in a California district court, accusing Apple of not repairing broken handsets that are out-of-warranty without charge, despite

knowing about the design flaw. The suit also accuses Apple of fraud and of violating consumer protection laws.

The plaintiffs claim that the touchscreens are unresponsive because Apple didn’t put any shielding protection in place for various components in the phone, though it had previously been used in the iPhone 5. Therefore, the suit claims that the models were “not fit for purpose”. Of course, the plaintiffs want damages, the level of which is undisclosed.



## Pinnacle Studio 20 Ultimate

An upgrade to Pinnacle's premiere video editing solution, Studio 20

### DETAILS

- Price: £100
- Manufacturer: Pinnacle
- Website: [www.pinnaclesys.com](http://www.pinnaclesys.com)
- Requirements: Windows-based PC with Dual Core 1.8GHz Core i3 or AMD Athlon 64 X2 3800+ 2.0 GHz or higher, 4GB RAM 8GB free disk space



▲ The main interface showing just a fraction of the included effects.



▲ You can create DVD's with full menu structures.

I think it's fair to say that the smartphone has put high-resolution video into the hands of the masses. Yet the clips we see on social media, and sites like YouTube, tend to be full of superfluous (and badly composed) footage, that any self-respecting videographer would have edited out. To be honest, there's no excuse for that because there are plenty of reasonably priced editors available. Take for example Pinnacle's Studio, now in its 20th edition.

It includes every possible way to edit and improve your raw video and, what's more, it's relatively inexpensive and very easy to use. Although there are three versions, this review covers the Ultimate edition which represents (in our opinion) the best value for your money. In addition, the product has recently been updated with some new and enhanced features that make it even more appealing.

Like most video editors Pinnacle's Studio provides an interface that follows an almost accepted layout, with the timeline clips at the bottom of the screen, a project bin above it, with a review/edit monitor on the right. This arrangement

is fixed, but can be resized to make more space for the area you're working on. What elevates Pinnacle above other video editors is its slick ease of use and fluid playback. These features alone can make quite a difference to the speed and comfort of the editing process. Let's take a quick look and evaluate the new features in this release, then...

Firstly, if you've ever fancied trying your hand at animation, the new Stop Motion Animation feature is all you'll need. Along with the normal guides, it includes an onion skin mode, a feature used in conventional animation to make the composition of each frame easier. You can also view a live preview before capturing each frame.

Have you ever seen those clips where they've blurred out someone's face, even if they're moving? This is called track motion and it's another addition to this release. You might think when would I use that, well it has a secondary use, you can get it to track a person or other moving object using a graphic or piece of text to follow along. So for example if you'd filmed a car race, you could put an arrow over a particular car and the arrow would track it; identifying for the viewer the car or person driving it.

For the first time, Studio now supports 360° video. So if you're lucky enough to have such a camera, you can edit your video and add titles to it in Studio 20.

For some time you've been able to modify the transparency of a track by using the special effects in Studio. However, in this release they've extended the facility so you can change it on individual clips within the timeline. This allows you to have two or more tracks playing at the same time, with different levels of transparency; making it easy to create multiple overlays. They've improved a few other features as well, for example the pan and zoom which, as well as some new presets, now has a dedicated editor. Similarly, picture-in-picture can now be controlled directly from the preview window.

Finally, in addition to the massive range of effects already supplied, the package now includes the NewBlue Video Essentials 3, adding easy split-screens, the ability to spotlight areas of interest, smooth edges or improve contrast.

One little complaint: although the package includes a host of import and export formats, if you want to produce Blu-ray disks you have to pay an additional fee of £6.08 from inside the program.

**mm Joe Lavery**

**Pinnacle Studio 20 continues to be good value, adding some worthwhile features in this release**



# WD PiDrive 314GB

Every great Pi deserves a drive that it can call its own

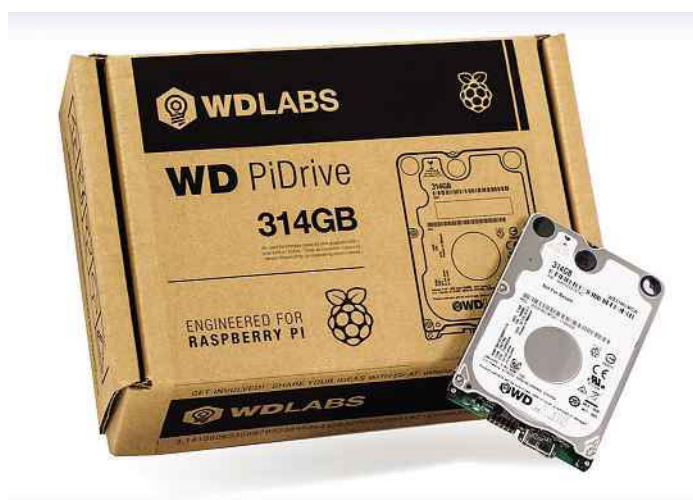
## DETAILS

- Price: £27.09 from WDStore
- Manufacturer: Western Digital
- Website: [tinyurl.com/glm594w](http://tinyurl.com/glm594w)
- Requirements: Raspberry Pi Model B+, 2 Model B, 3

Everything about this product is odd. It combines weird capacity with a curious purpose and unexpected interface. Yet the Western Digital PiDrive has a worthy objective for those that love their Raspberry Pi, and need more storage than flash modules generally offer.

Looking at the bare mechanism in isolation, this is a single platter 2.5" laptop drive repurposed for USB use. Where it diverges from its WD Blue origins, though, is its lack of a SATA connection – as the Raspberry Pi it's intended to support doesn't include that port. Instead, the PiDrive has a Micro USB 3.0 port and a USB controller, and included in the kit is a cable that you can use to hook it up to your single board computer.

To help integrate it with the Pi, and allow it to operate as a system drive, Western Digital provide a BerryBoot utility that you place on a 4GB SD card and then boot with the PiDrive also attached to Pi. Using BerryBoot, you can then download install an OS to the PiDrive from a wired or wireless network connection, leaving you with a Pi with at least 300GB of storage for whatever apps and data you'd like to use.



Because the Pi can only boot from Micro SD card you can't then completely dispense with that, but the root location can be easily redirected the PiDrive, and BerryBoot will make those changes for you.

To test the performance available from the PiDrive I used a PC, something that might seem counter-intuitive. However, I needed to know what the drive can actually do at full speed, and as the Raspberry Pi doesn't actually

have a USB 3.0 port needed to do that. Using that interface the drive achieves a respectable 91MB/s in both read and write, though if you use a USB 2.0 cable – as the Pi would – that drops to 43MB/s, squeezing every last bit of the bandwidth USB 2.0 has to offer.

The truth of the matter is, however, that 43MB/s is probably bandwidth than you will get out of the Micro SD card slot on the Pi, irrespective of what media you use in it.

That means the PiDrive should speed up your existing RPi setup as well as making it more versatile.

Where it won't win is in respect of power consumption, by the very nature of having a spinning disc it will consume more power than flash. That might be critical if you use your Pi battery powered, as the draw will be significantly higher with the PiDrive attached.

It also has implications if you attached the drive via a USB hub, because that will also need to be externally powered also.

As a promotion at the WDStore you can get the PiDrive 314GB drive for just £27.09, a big reduction on the usual £39 price tag. And, they also make a lovely WD PiDrive Enclosure kit that allows you to combine the drive with the official Raspberry Pi case into a single extended box, all for £7.

Raspberry Pi fans, can you please form an orderly queue.  
**mm Mark Pickavance**

**An affordable hard drive for the Raspberry Pi**



# Western Digital My Passport Wireless Pro 2TB

Western Digital's second stab as a mobile wireless NAS box

## DETAILS

- Price: £149.99
- Manufacturer: Western Digital
- Website: [www.wdc.com](http://www.wdc.com)
- Requirements: Wireless capable playback devices (Smartphone, tablet, laptop, etc.)

If you're not familiar with the concept, the thinking behind this device is to provide a combined storage and Wireless access point. On a long journey or getaway, you can store all your media on the 2TB drive (or 3TB if you have that model) and then stream that to your mobile hardware easily.

The original WD My Passport Wireless did much the same thing, but the new Pro model has added some significant enhancements. For a start, it supports 'ac' class wi-fi, covering both the 2.4GHz and 5GHz frequency ranges, where the original was only 'n' class. This won't be important if you only stream music, but if you like HD videos then you'll generally enjoy a better experience.



“ This is a much improved solution, and it performed flawlessly ”

Also, the SD card slot has now been updated to USB 3.0 spec, enabling it to read at 65MB/s and write at 40MB/s, if your cards can handle those speeds.

Photographers are the target audience there, as this hardware is ideal for securing still images or video you've captured for later PC/Mac processing. It also has a USB port you could plug any storage device into, and which can be used to dump contents.

The final enhancement is a bigger battery – now 6400 mAh – that the maker claims can power the unit for up to 10 hours of streaming HD video. That's good, but the icing on that cake is that the unit has a USB 2.0 host port that allows you to use that power to charge phones and tablets that use 5V at 1.5A.

Recharging that battery can be done either by connecting it to a PC using the provided

cable or via the dedicated 12.24W adapter that comes with it.

A full charge using the adapter takes around three hours, though you can get a workable percentage in an hour if you are running to a tight schedule.

That's plenty of boxes ticked, but investing this much money does require some due diligence about what's inside the black box, other than the exFAT formatted hard drive.

A deeper investigation of this device revealed some interesting details about how WD has constructed it using mostly off-the-shelf parts. The processor is an ARM-based Realtek RTD1195 Dual Cortex-A7 SoC, and that's





CrystalDiskMark 5.0.2 (64)			
File Settings Theme Help Language			
All	S	1GB	E: 0% (1/1859GB)
		Read [MB/s]	Write [MB/s]
Seq	Q32T1	113.3	112.0
4K	Q32T1	0.573	1.439
Seq		113.5	112.6
4K		0.531	1.408



designed to connect easily to the Realtek RTL871X wi-fi SoC, and the two Realtek WLAN radios for 'n' and 'ac' operations. WD provided the storage themselves with a WD Blue 2TB 2.5" drive, and it also provided a custom plastic enclosure for the unit.

The RTD1195 CPU provides plenty of power, allowing WD to promote this as the world's first portable Plex media server. Technically that's true, though it doesn't include a hardware transcoding capability like

many NAS boxes now offer when working to that end.

In terms of benchmarking, when the drive is attached to a PC expect file transfer speeds around 113MB/s. While being modest, it's realistically more than enough to support the wireless connection demands likely to be made on it. Wireless performance overall is very dependent on the frequency range used and the distance from the unit. With the 5GHz range, I got nearly 200Mb/s with it

alongside the test adapter and about 40% that level using 2.4GHz. That's enough speed in both ranges for the majority of uses, though if you want the best range, connect with 2.4GHz not 5GHz.

A slight disappointment was that the wireless configuration is 1x1 on both ranges, where the original unit had 2x2 on its 802.11n adapter. Without MIMO or more antennas the performance is going to degrade with each subsequent user, and more than it would with a 2x2 configuration.

That said, there is enough bandwidth to handle at least four HD video watchers simultaneously, or significantly more less-demanding clients.

There is also an inherent weakness in this design that undermines all the wireless storage devices I've seen so far, unfortunately. By their very nature, once a phone or tablet is connected to the My Passport Wireless Pro it is disconnected from the internet. It is possible to provide the unit with a local wi-fi password, but relaying only works if you have a nearby access point.

Being unable to redirect to GSM/4G network leaves you disconnected from the internet while using the wi-fi

service. That's a major problem because most people want to be able to listen to music or watch videos, but also get emails and social media messages simultaneously.

That point aside, this is a much-improved solution, and using it with both a laptop and an Android phone it performed flawlessly. I also very much like what this device can do, and how nicely it integrates with the existing WD My Cloud software and services already on offer.

As an external 2TB drive, the price might seem steep, unless you've got a car full of bored youngsters or a media collection that likes to travel with you.

**mm Mark Pickavance**

**A well considered and featured wireless enabled storage system**





# MSI GTX-1060 Gaming X 6G

Blistering gaming performance from an entry level series-10 GPU

## DETAILS

- Price: £294
- Manufacturer: MSI
- Website: [goo.gl/WVTxEI](http://goo.gl/WVTxEI)
- Requirements: Spare PCI-E x16 slot, 400W PSU, Windows 7+ for software

We've seen a few GTX-1060 cards recently, from the reference models to ones from ASUS, Palit and Zotac. Now, though, we have MSI's take on this popular, series-10 entry level card from Nvidia.

The MSI GTX-1060 Gaming X is an exceptionally well-designed graphics card. The large MSI signature red and black colouring on plastic housing surrounding the two 95mm TORX 2.0 Twin FROZR VI fans looks truly magnificent. The all-black PCB, and further black backplate (emblazoned with the MSI dragon motif) is equally striking, especially against the large aluminium heatsink and nickel-plated copper heat pipes.

Cooling and airflow are essential here, as MSI has included two modes above the stock GP106 GPU clock speeds. The Gaming Mode will boost the GPU clock speed from 1506MHz to 1569MHz, with a boost clock speed of 1784MHz; both of which are 4% higher. The OC (overclock) mode pushes the GPU even further, with a base clock speed of 1594MHz and a boost clock speed of 1809MHz, nearly 6% higher than the stock GPU speed.

The 6GB of GDDR5 memory is clocked to 2002MHz, and has a memory bandwidth of 192.2GB/s. There are 1280 CUDA Cores, and the GTX-1060



▲ The MSI GTX-1060 Gaming X is a superb example of the entry level 10-series Nvidia GPU



▲ It's superbly designed, and looks pretty marvellous

Gaming X features a pixel rate of 75.3Gpixels/s, a texture rate of 125.5GTexels/s, and a floating point performance value of 4,017GFLOPS; again, all of which are considerably higher than the reference GTX-1060.

Connectivity is ample, with three DisplayPorts, a single HDMI, and single DVI. It's a larger card than most other GTX-1060s we've seen, measuring 279mm in length, but that's forgivable when you consider the high degree of manufacturing that's gone into the custom PCB, premium caps and super ferrite chokes that MSI proudly use to enhance its products with. To add to that,

there are red LEDs surrounding the second fan, and there's also an LED-lit MSI logo at the top-front of the card that can change effects and colours with the appropriate software.

In terms of performance, the MSI GTX-1060 Gaming X doesn't disappoint. In Gaming Mode, we clocked *Doom* at 106fps, with the maximum settings applied throughout and running at 1920 x 1080. Even when we pushed the resolution up to 4K, the Gaming X still managed to tackle it at 34fps. The same went for *GTA V*, with the Gaming X managing 103fps at 1920 x 1080, at Ultra settings, while dropping to an equally good

35fps at 4K resolutions.

The Gaming X is also perfectly happy to be overclocked, and it's remarkably easy thanks to the included MSI Gaming software. We managed to tune the base clock to 1687MHz, nearly 100MHz faster than the OC Mode, with the GPU temperature hitting just over 70°C and the fan speed at a little over 1200rpm. This increased the frames per second across the two tested games by around 10fps each, which greatly improved the visual quality.

MSI has done an incredible job with its GTX-1060 Gaming X. The card is superbly presented, has plenty of overclocking potential, and performs excellently. Sadly, we didn't have access to a HTC Vive for testing VR gameplay at the time of writing but, considering what we've already experienced with other GTX-1060s, the MSI Gaming X should easily handle any VR game or demo currently around.

It's about £50 more expensive than some other 6GB GTX-1060s available, but at £294 you're getting one of the best examples of a 1060 we've seen so far. **mm David Hayward**

**Quite possibly the best GTX-1060 card we've tested so far**



# AOC U2879VF 28" FreeSync 4K Monitor

Are AOC ushering in the era of affordable 4K gaming?

## DETAILS

- Price: £274.98 (Ebuyer)
- Manufacturer: AOC
- Website: [aoc-europe.com/en/products/u2879vf](http://aoc-europe.com/en/products/u2879vf)

I've been in the market for a 4K screen for a while, and AOC has released some more affordable designs that could well fit the brief. Of these, the 28" AOC U2879VF is probably the most practical, because it's designed for those that need the resolution for work as well as for play.

Using TN panel technology, the U2879VF manages to deliver not only the highly desirable 3840 x 2160 resolution, but also drive it at 60Hz. So, unlike some screens I could mention, the mouse pointer won't lag horribly, and it has a refresh fast enough that it is also suitable for gaming.

Actually, AOC went a stage further with this design, and made it compatible with AMD's FreeSync technology, so the screen can actually be slaved to the framerate of the video card. Or rather it can if the frame rate

is in a rather right window between 40- and 60fps. For those wondering, it isn't compatible with Nvidia's G-Sync, but as that required additional expensive hardware I wasn't expecting it to be.

Those gaming boxes ticked, how useful is the U2879VF for more serious applications? Rather more desirable than this reviewer was really expecting, it turns out. The standard inputs include DisplayPort, DVI, HDMI 2.0 and VGA curiously. You'll need to use DisplayPort or HDMI if you want to utilise the full resolution available. The colour

representation is enhanced by using Frame Rate Control and, with a card that supports it, a 10-bit colour mode can be used.

That's a feature I'd associate more with professional displays, as is uniformity compensation mode but that's included too. Colour accuracy wasn't dialled in right out of the box but, with a little tweaking, you can get pretty good representation as long as you are prepared to hone the calibration. For those wanting the easy route to great settings AOC included an sRGB preset colour temperature, but using it does disable brightness control, regrettably.

What also impressed was that this is the first monitor that I've covered that wasn't sold exclusively for professional photo work that actually came with a colour uniformity data sheet, outlining the Gamma, Average Delta E – and even a 25 point brightness uniformity map.

The colour isn't perfect, but it's much better than I've seen in anything labelled for gaming, and if I'm honest a few screens supposedly for professional use.



What the AOC U2879VF ultimately delivers is a jack-of-all-trades that is excellent for general use, has some gaming potential if you use an AMD video card, and isn't a complete disaster if you desire accurate colour. Regrettably, for this writer's personal use, I discounted it the moment I noticed that it didn't have a VESA mount, and the connectors face away and not downwards. The lack of an integrated USB hub simply polished it off.

If none of those things are critical to you then you could do much worse, and pay a great deal more than this for what is a rather classy act.

**mm Mark Pickavance**

**A 4K display built to attract gamers and professionals alike**

## AOC U2879VF Specs

Monitor Size: 28"

Screen Format: 16:9

Brightness: 300cd/m<sup>2</sup>

Contrast Ratio: 1000:1

Dynamic Contrast Ratio: 80M:1

Viewing Angle: 178/170

Response Time: 1ms

Max Resolution: 3840 x 2160 @60hz

Inputs: VGA, DVI, HDMI, DisplayPort

Power Consumption: On 49W, Standby 0.32W, Off 0.23W







# Dashlane 4.5.2

Roland Waddilove tries a tool to securely store all your passwords and notes, and log you into websites

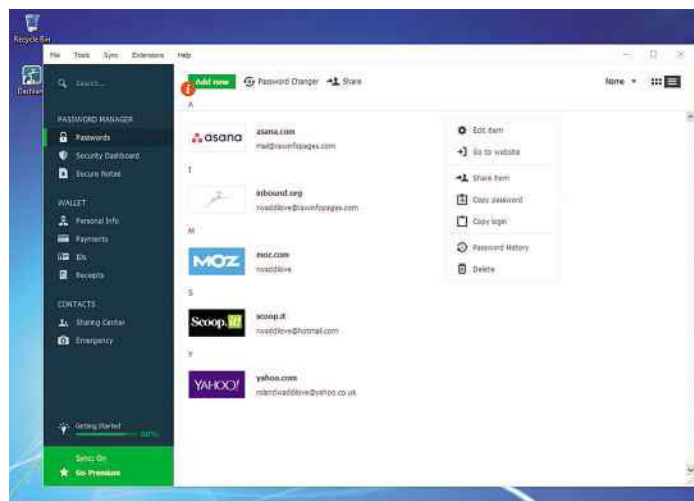
## DETAILS

- Price: Free/£36 a year
- Manufacturer: Dashlane
- Website: [www.dashlane.com](http://www.dashlane.com)
- Requirements: Windows XP, Vista, 7, 8, 10, 1GB RAM, 1GHz processor, 140MB disk space

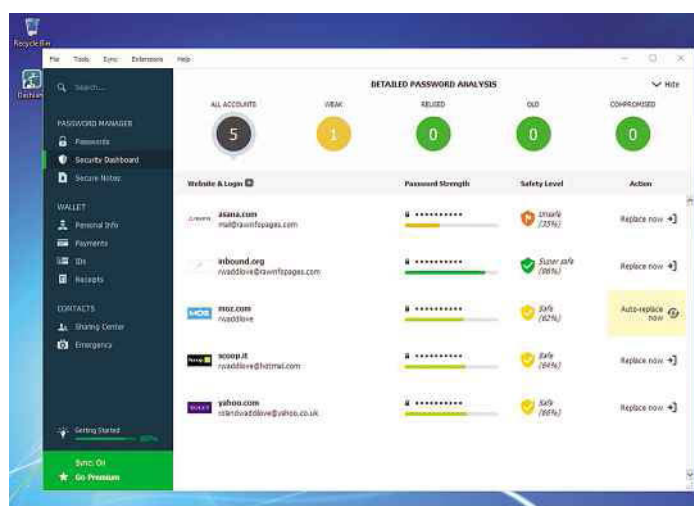
These days nearly every website and online service requires you to log in with a username and password and it is bordering on impossible to remember them all. With Dashlane you don't have to; it is a password manager that aims to relieve you of that particularly loathsome burden.

It offers browser extensions for Chrome and Firefox, a desktop application, and apps for Android and iOS. All the apps and extensions receive updates from time to time and the most recent of these was a huge makeover for the iPhone and iPad apps.

The desktop app is where you access everything in your secure Dashlane account, and it looks good. It stores passwords to websites and web services, such as your email, online bank, PayPal, eBay, Amazon and everything else you need to log in to. Sites and login details can be added manually, but it is easier to add them on the go from a browser. When you log in to a website, Dashlane pops up asking if you want it to store the details and it automatically captures the URL, username, and password. The next time you visit the site, Dashlane fills in the login details



▲ The desktop app provides access to all of your securely stored information



▲ The security dashboard shows which passwords are weak and should be changed

automatically. It's very easy and convenient, and you don't need to remember that site again.

A digital wallet can be created in the desktop app for storing credit cards, PayPal accounts, and bank accounts. These can be used to quickly fill in checkout forms when shopping online. The desktop app provides secure storage for any text and you can create notes and store whatever personal or private information

you want, like credit card PIN numbers and that three-digit code on the back, your bank account details, club memberships and so on. It is not just for website logins.

If something serious happens to you, a partner or relative might need to access online banks and other accounts, so there is an emergency contact feature available. You can specify someone else who can gain access to your account and

you choose the number of days they have to wait, from none to 60. You are notified when they try to log in and you can decline access if it's not an emergency, just your partner snooping!

Another useful feature is the ability to share passwords. You won't want to do this with many passwords, but a work account, a family Netflix account, and a few others could be shared. You can limit what others can do with these passwords; sharing them with others can be blocked, for example.

If you are using another password manager right now, you can import everything into Dashlane. It can read login details from Chrome, Firefox and Internet Explorer, and it can import data exported from LastPass, 1Password, RoboForm, Keepass and others.

The main limitation of Dashlane free is that you can only use it on your PC. For £36 a year your account can be synced across all your PCs, phones and tablets, enabling you to access everything everywhere. There is a clever password changer that automatically replaces weak passwords with strong ones on many popular services. Dashlane works well and is recommended.

**mm Roland Waddilove**

**A password manager is essential and Dashlane does the job well**



# Asus ROG Strix Wireless Gaming Headset

Asus unleashes an angry Strigiforme on your ears

## DETAILS

- Price: £110 (Overclockers)
- Manufacturer: Asus
- Website: [tinyurl.com/zgdxsma](http://tinyurl.com/zgdxsma)
- Requirements: PC, MAC, Mobile device, PlayStation 4 or Xbox One



Asus has expanded its Republic of Gamers brand extensively in the past few years, and as part of that it's now included the Strix collection of headsets. The lowest rung is the Strix 2.0 wired headset for about £50, and at the very top is a noise-cancelling 7.1 pair for closer to £150. This wireless pair sits roughly in the middle, offering 7.1 virtualisation, but no noise-cancelling.

On removing them from their packaging, primitive psychology immediately told me that these headphones weren't happy. In fact, they resemble an angry owl that's annoyed at me! However, once I'd got them on my head, and couldn't see the accusatory eyes, I felt much less threatened and ready to

enjoy what acoustic pleasures Asus has provided.

The memory foam-filled ear cups are very comfortable, though the amount of plastic used in their construction is a little disconcerting. Whatever they're made with, I didn't suffer any discomfort after long wear periods and the padded headband does its job well of distributing the loading across the head.

Along with the headphones Asus provides a small selection of accessories as part of the package, specifically a USB charging cable (no charger), 3.5mm audio extension, line splitter and a boom mic. I'm not a huge fan of TeamSpeak and the like, however, so

being able to leave the microphone disconnected was a useful option.

As with any speaker system that doesn't actually have eight drivers, the 7.1 output through these is virtual, but it's none the less impressive. Asus have designed a software tool called Sonic Studio that allows you to control precisely the audio experience, and tailor it to the usage scenario. Even if you don't use this, these sound wonderful to my ears – especially in combat games, where they generate excellent low-frequency rumbles and dramatic snaps and pops. Movie watching was also a delight, with dialogue very clearly audible even over dramatic musical scores or heavy action effects. A rating of 15m demonstrates that this is a very high quality audio output device.

Unfortunately, it's not all good news. The flaw in this design isn't in the audio representation, it is the plastic frame that encases the 60mm drivers. Any movement of the jaw or contact with the frame generates creaking sounds that resonate throughout the headset. If you're

listening to anything quiet or subtle it can easily be ruined by these extraneous sounds.

That's a real shame because the battery life – at 10 hours – is decent, and the range of the 2.4GHz wireless connection is also very good. I was able to walk throughout my entire home and get sound wirelessly transmitted from my PC.

I don't have either of these consoles, but I'm told that they work as per the PC on the PS4 and, with an adapter, on the Xbox One too.

**mm Mark Pickavance**

**Excellent gaming audio marred by a creaky frame**

## Key Features

- Low-latency 2.4GHz wireless connection
- Dual-antenna design
- 7.1 virtual surround sound
- Full audio control with Sonic Studio
- Compatibility with gaming consoles, PCs, Mac, and mobile devices
- 10+ hour battery life



# GROUP TEST

## 8GB Memory Kits

Although 16GB is becoming the norm with new, future-proofed systems, at the moment 8GB is considered all a PC user needs unless they're running virtual machines.

With both DDR3 and DDR4 memory available, you could spend quite a bit of time looking for the best deal for the best performance. Therefore, we have six 8GB memory kits on test, three DDR3 and three DDR4, so to see which is worth your consideration

## 8GB Memory Kits

### Corsair Vengeance Pro

#### DETAILS

- Price: £50
- Manufacturer: Corsair
- Website: [goo.gl/No1BIM](http://goo.gl/No1BIM)
- Requirements: DDR3 compatible motherboard



▲ The Corsair Vengeance Pro Red DDR3 memory kit is a good all-round setup

Corsair has continually proved itself to be a driving force in the computer RAM market place. Most of the power and gaming specific system builds you'll come across feature Corsair RAM, purely because of the good value it offers as well as the quality of the manufacturing process and overclocking abilities.

Designed to work with 3rd and 4th generation Intel processors, the Vengeance Pro kits are available in a range of capacities and speeds. From an entry point of 1600MHz through to 3200MHz, and available in an assortment of colours, the Vengeance Pro pretty much has something for every type of system builder.

The 8GB kit we're looking at here is the 2x 4GB DDR3 2400MHz Red version (product code CMY8GX3M2A2400C11R), with a latency of 9-9-9-24, and running at 1.5V.

The Red title is purely for show, it being the very snazzy colour of the top of the heatsink. While it doesn't have any bearing on how well the memory performs it is pretty nice to know that it is also available in blue, silver and gold, so it can match your LED setup, motherboard or whatever else you've installed for a showcase system should that be your thing.

In terms of overclocking potential, we managed to tune

the speed up to a tad over 2500MHz on our motherboard, with everything remaining perfectly stable. We imagine that with a better motherboard in place you could tweak it further – to 2600MHz and beyond, more than likely – but as we didn't have anything available we had to make do with our current setup. Interestingly, the eight-layer PCB of the Vengeance Pro has been designed specifically with overclocking in mind, reducing electrical noise and allowing a great optimisation and timings. In short, overclockers will enjoy fiddling around with the Pro kits to their hearts content, and will undoubtedly achieve some pretty impressive results down the line.

The height of the sticks is 44.5mm, which – although are somewhat big – doesn't make them it tallest RAM sticks we've ever come across. For the most part you shouldn't have too much difficulty fitting it alongside the majority of large CPU coolers but, as always, it's best to measure up the clearance before you commit to buying anything.

We used SiSoft Sandra for the memory benchmark, recording 31GB/s when not overclocked, and managing 34GB/s when overclocked to 2525MHz. How those

numbers fair in real world computing terms depends on the rest of your setup. Our gaming tests proved to run well with GTA V and a couple of other choice titles.

The only thing we didn't like about the Vengeance Pro was the fact that the red-coloured aluminium strip on top of the heatsink could be unclipped rather too easily. That means if you attempt to remove the stick from the motherboard without paying due care and attention, the clip can come off and perhaps get wedged under the board, or dropped. It's a small likelihood, but one worth noting if you're a bit clumsy.

We were impressed with the Corsair Vengeance Pro 8GB kit. It's priced at around £50, and offers great performance and plenty of good, stable overclocking potential.





# Crucial Ballistix Sport

## DETAILS

- Price: £70
- Manufacturer: Crucial
- Website: [goo.gl/pp3qQE](http://goo.gl/pp3qQE)
- Requirements: DDR3 compatible motherboard

Crucial is very much like Corsair, in that the company is often as highly regarded and its memory is used in a range of systems – from standard desktops through to powerful gaming machines.

Crucial has a vast range of kits available too, all at different speeds and capacities and all named something exciting to entice the buyer and separate them from the standard Crucial memory kits. Specifically, this time we have the Ballistix Sport 8GB DDR3 PC3-12800 1600MHz kit (product code BLS2CP4G3D1609DS1S00CEU), priced at roughly £69 – although you could probably find the kit a little cheaper if you shop around.

Crucial has greatly improved the quality of its RAM over the years and as a result the DDR3 batch of the Ballistix Sport range, has an impressive list of technical specifications and manufacturing processes after its name. In this case, the Sport range we have here is designed for standard desktops, whereas the Sport VL has a low profile design, Sport XT is much taller and a little faster for extreme gaming builds, and the Sport SODIMM is designed for laptops or other ultra-compact systems.

This kit runs at 1.5v, has a latency of 9-9-9-24 and a clock speed of 1600MHz. It's a mid-range pair of 4GB sticks and, as such, it won't perform quite



▲ The Crucial Ballistix Sport is a pretty basic RAM kit

“ As an entry level kit, it doesn't have the same overclocking abilities ”

as well as some of the top of the range and faster kits available. Measuring 31.5mm in height, it isn't as tall as the previous Corsair models, and as such is probably more compatible with a wider range of systems.

As this is an entry level memory kit, it also doesn't have quite the same overclocking abilities as some of the other examples we have on test. In short, overclocking wasn't too successful in this case.

Having said that, though, the benchmark for the Ballistix Sport managed a decent 23GB/s, not bad for 1600MHz memory considering the general average seems to be around 20-to-21GB/s for this type of memory. So for most users, you'll never need to dip into the arcane art of overclocking.

In terms of real world computing, we did see some slowdown on the games we were testing, although only on the newer titles. The likes of *GTA V* worked just as well with this 8GB kit as it did with the Corsair entry. *Fallout 4*, though did seem to stutter slightly when delivering more intensive scenes. However, for general computing use, the memory proved to be stable and adequate.

The Crucial Ballistix Sport 8GB kit is actually pretty good. The Ballistix Sport XT is probably the modern gamer's choice of DDR3 memory, at 1866MHz, although it's less compatible due to its size. In all honesty, though, the more modern motherboard owner will probably opt for the Sport DDR4 RAM kit.



▲ There's no overclocking, and it's quite expensive

The Ballistix Sport is perfectly capable and little easier to accommodate than bigger RAM sticks. It is far too expensive, though, considering its lack of overclocking potential.



## 8GB Memory Kits

# Kingston HyperX Savage

### DETAILS

- Price: £42
- Manufacturer: Kingston
- Website: [goo.gl/1IEAJn](http://goo.gl/1IEAJn)
- Requirements: DDR3 compatible motherboard

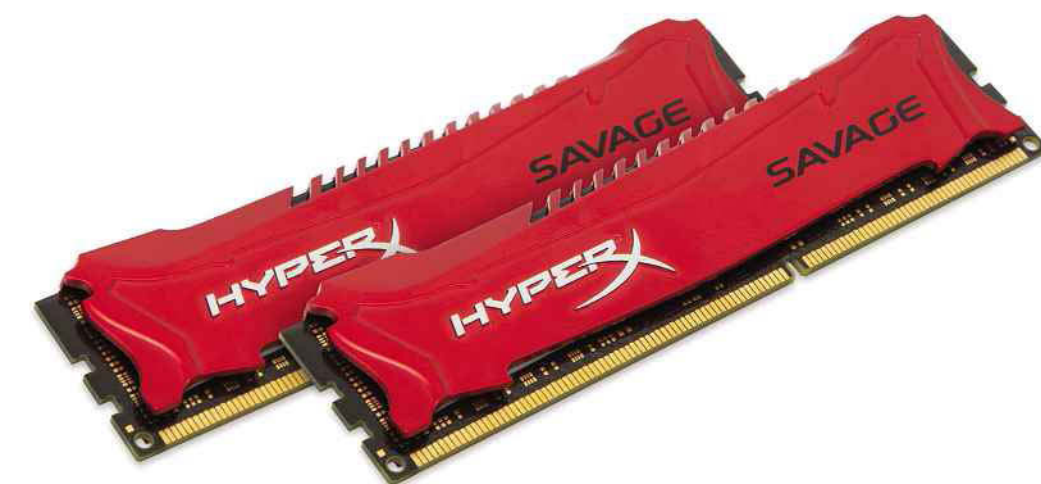
**K**ingston has been in the RAM industry for as long as most of us care to remember. As can be expected, then, the company offers a vast range of memory types from a standard workstation through to a more elaborate and impressive setup.

The HyperX range consists of the Fury, Savage (which we're reviewing here), Predator and Impact. Fury is the entry level HyperX memory, with Savage taking the mid-range spot before the extreme DDR3/4 Predator steps in. Impact is the mobile and small platform SODIMM version, lying somewhere between the Savage and the Predator desktop equivalents.

The HyperX Savage kit we have comes in a pair of 4GB sticks at 2400MHz, with timings of 11-13-14-32 and a voltage of 1.5v (product number HX324C11SRK2/8). These are the 2400MHz versions, sitting at the top of the line.

The design of the RAM is quite impressive. Rather than opting for a taller heatsink, Kingston decided on a large red aluminium heat spreader with a saw-like ventilation section mid-way across the top. Surprisingly, even with the heat spreader installed, the height of each individual stick is only 33mm.

There's a lot of thought gone into the aesthetics of the memory, so the showcase system builders, or simply those who like to have matching LEDs and



▲ The Kingston HyperX Savage DDR3 RAM is an excellent choice for any user



▲ There's plenty of overclocking potential, and it's well priced too

“ The cost of this kit is low, considering its speed and overclocking potential ”

other components, will be happy. We particularly liked the black PCB under the red aluminium heatsink; it's a good effect, and one we think makes a real stylistic flourish.

The SiSoft Sandra benchmark recorded a new group leader of 33GB/s with the default settings. After playing around with

overclocking we managed to tweak the HyperX Savage pair to a decent 2535MHz, which upped the benchmark score to 37GB/s.

Admittedly though, we didn't feel comfortable with the overclock as, after just ten minutes, you could feel the heat from the RAM when getting within a few inches of it. So we

dropped everything back to default setting; to be fair, 2400MHz is plenty fast enough. As you can assume, though, the Kingston HyperX Savage kit played every game without any issues, as well as the usual desktop duties and so on.

The cost of this kit is surprisingly low, considering its speed and overclocking potential. We found the price varied somewhat, but the average was around £42 – which also places it as the cheapest DDR3 kit so far in the group. It is amazing value, because the Kingston HyperX Savage is a great 8GB RAM kit. There's plenty to like and the performance offered is well worth the cost.



# Corsair Vengeance LPX DDR4

## DETAILS

- Price: £45
- Manufacturer: Corsair
- Website: [goo.gl/UUV3r](http://goo.gl/UUV3r)
- Requirements: DDR4 compatible motherboard

The first of our DDR4 8GB memory kits brings us back to the Corsair Vengeance, which is obviously an updated version of the previously reviewed kit with a DDR4 288-pin setup. There are three visual versions of this kit available – with either a black aluminium heat spreader, red heat spreader or a blue heat spreader. As far as we can tell, there's nothing different between the specifications here, so in our case we had the black heat spreader version in for review.

This is an interesting memory kit here, running at 2,666MHz, with a latency of 16-18-18-35, and at 1.2V. The aluminium heat spreader has been developed for better heat dissipation across the stick, as is the eight-layer PCB. This, of course, means you'll be able to



▲ There's loads of overclocking potential available, and it's reasonably low-profile too

overclock it to higher than average speeds, and as such not suffer too much from an overheated RAM stick.

It's also one of the most affordable DDR4 memory kits we've had in for review. Priced at just £45 (via Overclockers UK), this is an excellent performing DDR4 RAM, with a high memory bandwidth and the potential for further tweaking should you wish to attempt it.

Each module is just 33.5mm in height, making it only half a millimetre higher than that of the Kingston HyperX Savage DDR3 memory, and nearly 10mm shorter than the Corsair Vengeance Pro DDR3 memory. Needless to say, 33.5mm is low profile enough for most ITX or small, media-type systems and setups.

As for performance, the base clock speed setup produced a bandwidth of

32GB/s. We did manage to get the Corsair Vengeance LPX DDR4 to an overclocked speed of 3110MHz, which is pretty good and everything appeared to be stable. The benchmark at this speed was a very impressive 46GB/s.

Needless to say, the games we tested performed exceptionally well with high frame rates across each title. Other duties, such as video editing and so on, also performed well and the memory, as we said, seemed to be quite stable at that speed. They were a little hot once the PC was powered off, but nothing like the Kingston HyperX Savage DDR3 memory.

The Corsair Vengeance LPX DDR4 8GB kit is an excellent, value entry to the DDR4 section of this group. It's quick enough at its base speeds, only 1GB/s behind the Kingston HyperX

Savage entry, but the overclocking potential is superb and remarkably stable.

Of course overclocking isn't to everyone's tastes, and thankfully the Corsair Vengeance LPX DDR4 kit performs well without having the need to push it and your PC to the limits. For just £45 it's a good choice for both budget DDR4 based system builders and enthusiasts alike.



▲ The Corsair Vengeance LPX is a great DDR4 memory kit for the gamer





## 8GB Memory Kits

# Kingston HyperX Fury DDR4

### DETAILS

- Price: £35
- Manufacturer: Kingston
- Website: [goo.gl/qXMK9K](http://goo.gl/qXMK9K)
- Requirements: DDR4 compatible motherboard

**W**e're back with another Kingston 8GB memory kit this time, one that's DDR4-specified instead of DDR3. The HyperX Fury DDR4 is the follow-on product line from the Fury DDR3, and presently falls within the mid-range memory kits for the gaming and overclocking enthusiast. It comes in a variety of speeds, and capacities, from 2,133MHz to 2,666MHz, and from 4GB to 64GB kits.

In this instance we have a 2,400MHz, dual 4GB kit for review with a low latency of 15-15-15-35, and a typical operating voltage of 1.2v. While at 2,400MHz the Kingston HyperX Fury DDR4 kit does have an interesting feature in that it can recognise the host system, and will automatically – and safely – overclock the memory to a maximum of 2,666MHz.

The memory features a black aluminium heat spreaders across the PCB, which is angled at the top with some cut-out slots to exhaust any excess heat generated. The height of the Kingston HyperX Fury is just 34mm, including the heat spreader, making it 1mm taller than the other Kingston memory kit we have in the group. However, 34mm is still quite short for memory of this specification, so it shouldn't be too much of a problem fitting



▲ The Kingston HyperX Fury is a fantastic 8GB DDR4 memory kit

into systems where there's not much room, or clearance where there's a large CPU cooler in place.

The overclocking side of things was, as we mentioned, already taken care of thanks to the Kingston HyperX Fury

33GB/s, at the 2,600MHz auto-tuning speed we got 34GB/s – which seemed a little slow for the extra 200MHz. However, at the overclocked speed of 3,000MHz the Kingston HyperX Fury produced an astonishing

tested crashed during the ten minute test, which seems a little bit too much of a coincidence, especially as when we dropped the speed back down to the auto-set 2,600MHz the games played perfectly. Why the games were affected and not the benchmarks, we have no idea.

While the Corsair Vengeance LPX offers great value and performance, the Kingston HyperX Fury DDR4 kit proved to be a much better overall prospect. For just £35 (via Falcon Computers), this is an excellent 8GB DDR4 memory kit.

“ Overclocked to 3,000MHz, the HyperX Fury produced an astonishing bandwidth ”

auto-setup feature. Beyond that we were able to increase the memory clock speed to 3,000MHz, which appeared fairly stable. We could probably have increased that further, up to 3,111MHz (maybe even a tad more) but since we didn't want to push the system too hard we left the overclocked speed at the safer 3,000MHz.

At 2,400MHz the benchmark recorded a good

bandwidth of 49GB/s, which puts it at the top of the Group Test's leader board.

Although the memory appeared to be stable at the overclocked speed when benchmarking – and when using the PC for normal duties or video and picture editing – we did experience some crashes when gaming and pushing this RAM. This could just be a coincidence at that particular time, but each of the games we



# TeamGroup Dark DDR4

## DETAILS

- Price: £36
- Manufacturer: TeamGroup
- Website: [goo.gl/GKwDz1](http://goo.gl/GKwDz1)
- Requirements: DDR4 compatible motherboard

In all honesty we hadn't heard of TeamGroup memory before today. Originally thinking it was some cheapo setup from an unknown part of the world, we were happily corrected and discovered that Team RAM is actually a really good deal.

The TeamGroup DDR4 memory comes in a variety of styles, speeds, and capacities. The top-end of the product range is the Xtrem DDR, with overclocked speeds up to 4,000MHz, while the Vulcan DDR range caters for the slower end of the scale.

The Dark DDR, which we have to test here, sits neatly in the middle of the range, and offers clock speeds from 2,133MHz through to 3,200MHz in an overclocked profile. In this instance we're using the DDR4 3000 version, which as you can probably guess is clocked at an impressive 3,000MHz, and has



▲ *It's quick, and there's room for some overclocking if you have the kit available*

## “ The TeamGroup Dark DDR4 would seem to tick all the boxes ”

a latency of 16-16-16-36 and a voltage of 1.35v.

The style of the memory is quite unique. The Dark range feature a large aluminium heat spreader that juts up to points into what's almost a Batman symbol. This puts the height of each module to 41.3mm, which is quite tall for memory, but not as tall as the Corsair Vengeance Pro DDR3.

Although the TeamGroup Dark kit is already pretty highly clocked, it is apparently possible to hit as high as 3,560MHz; according to various sources on overclocking forums. We never got that far because the limitations of the motherboard, and the fact that we didn't feel safe pushing it

to that point and having to politely tell the supplier that we broke their memory.

We did, though, get an overclocked speed of 3,200MHz with everything seeming stable, and without too much heat radiating beyond the heat spreader.

The performance of the TeamGroup Dark memory at the standard 3,000MHz was a very good 35GB/s, which has made this the new default clock speed group leader. The overclocked results weren't quite as spectacular as we've already seen, topping out at a respectable 41GB/s.

Despite the overclocked speed not hitting as high a bandwidth as the Kingston or

Corsair DDR4, the bandwidth from the Dark DDR kit isn't exactly slow. As far as the games were concerned, everything worked well and produced better than average frames per second.

The TeamGroup Dark DDR4 memory kit would seem to tick all the boxes, the only issue we could possibly see is the height of the sticks. Remarkably, the TeamGroup Dark DDR 8GB kit is available for just £36 (via Overclockers UK), which is excellent value and worth a try if you've got the clearance and room to fit them.



▲ *The TeamGroup Dark kit is pretty impressive*

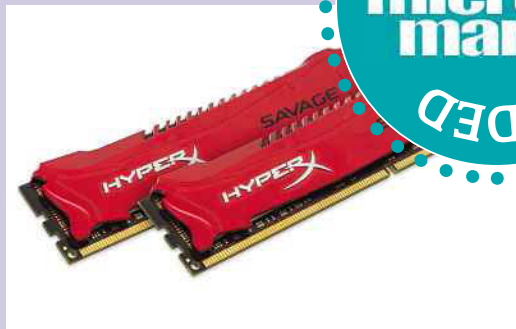




### TeamGroup Dark DDR4

Although the overclocked speed wasn't the fastest, and the height of the sticks not quite as low-profile as some of the others in the group, there was something about the TeamGroup Dark memory kit that we really liked.

It was simple, looked great, performed very well indeed and had the potential for some series overclocking. All that for just £36, too.



### Kingston HyperX Savage

From the DDR3 point of view, the Kingston HyperX Savage is an excellent choice for the enthusiast or gamer.

It's priced well and performs brilliantly. There's also room for overclocking, and it'll look great inside a showcase system too.

## How We Tested

Each memory kit was fitted to an ASUS Z170-A motherboard with an Intel i5-6600K clocked at 4.5GHz. We used SiSoft Sandra for the memory bandwidth benchmark, and *GTA V*, *Doom* and *No Man's Sky* for the games test.

	Corsair Vengeance Pro Red	Crucial Ballistix Sport	Kingston HyperX Savage	Corsair Vengeance LPX	Kingston HyperX Fury	TeamGroup Dark
Price	£50	£70	£42	£45	£35	£36
Height	44.5mm	31.5mm	33mm	33.5mm	34mm	41.3mm
DDR-type	DDR3	DDR3	DDR3	DDR4	DDR4	DDR4
Latency	9-9-9-24	9-9-9-24	11-13-14-32	16-18-18-35	15-15-15-35	16-16-16-36
Voltage	1.5v	1.5v	1.5v	1.2v	1.2v	1.35v
Default clock speed	2400MHz	1600MHz	2400MHz	2666MHz	2400MHz	3000MHz
Overclock speed	2525MHz	N/A	2535MHz	3110MHz	2600/3000 MHz	3200MHz
Default bandwidth	31GB/s	23GB/s	33GB/s	32GB/s	33GB/s	35GB/s
Overclock bandwidth	34GB/s	N/A	37GB/s	46GB/s	34/49GB/s	41GB/s



# Component Watch

**This week, we step-up a notch with five RX 470 graphics cards for you to compare**

**L**ast week we looked at the cheapest iterations of AMD's graphics technology, the RX 460. What if you've got a bit more to spend, though? Well, this week, we're going one better and looking at the RX 470. It's more powerful and the prices reflect that, but if you check out the deals we've found you may well feel more than happy about what it will cost you.

**Deal 1: PowerColor Red Devil RX 470 4GB**

**RRP: £190 / Deal Price: £176**

This PowerColor model is cheapest RX 470 on the market – at least at retail prices – at the moment and comes with 4GB of GDDR5 and a 1270MHz clock. Designed for performance gaming, the RX 470 is a strong piece of kit, and the dual fans fitted to this model are more than adequate for keeping it cool during pretty much any gaming situation. Display connectors include dual-link DVI-D, HDMI, and DisplayPort for a full set. Even if it isn't the best-performing card in its category, you be very lucky to find an RX 470 for a lower price than this.

**Where to get it:** Ebayer ([bit.ly/2bBCQKk](http://bit.ly/2bBCQKk))



**Deal 2: MSI Radeon RX 470 Gaming X 4GB**

**RRP: £200 / Deal Price: £191**

MSI's cheapest version of the RX 470 runs a slightly slower clock speed than the PowerColor by default – 1254MHz – but that's as close to identical as the previous card as makes no difference. Where the MSI Gaming X edition excels, though, is its cooling: it features the Twin Frozr VI cooler, with its heat pipes, and special dispersion fan blades. These are not only very effective but also extra-quiet. Connectors include dual DisplayPort, dual HDMI, and dual-link DVI-D. This offer amounts to less than 5% off the RRP price, and a fair bit more than the Red Devil, but it could be worth it if you need things ultra-cool.

**Where to get it:** Box ([bit.ly/2bBsD5k](http://bit.ly/2bBsD5k))



**Deal 3: Sapphire Radeon RX 470 4GB**

**RRP: £200 / Deal Price: £170**

The RRP of this card is higher than the PowerColor's, but its actual price is a lower because it's more or less the reference design; a single fan, and a slower clock speed of just 1216MHz in boost mode. It also has just two connectors: HDMI and DisplayPort. As RX 470s go, it's weak compared to the competition, but at least it's beating those cards on price.

**Where to get it:** Overclockers ([bit.ly/2c05Pve](http://bit.ly/2c05Pve))



**Deal 4: Gigabyte Radeon RX 470 G1 Gaming 4GB**

**RRP: £200 / Deal Price: £195**

Gigabyte's G1 Gaming edition of the RX 470 is hard to knock, with its high-end Windforce 2x cooling system and 1230MHz clock speed. Dual-link DVI-D, single HDMI, and three DisplayPort connectors complete the package. Gigabyte's hardware is reliably good, so you it's little wonder the discount's so small – at this end of the market, we'll take what we can get!

**Where to get it:** Scan ([bit.ly/2cekWSB](http://bit.ly/2cekWSB))



**Deal 5: XFX Radeon RX 470 4GB**

**RRP: £215 / Deal Price: £200**

The XFX Radeon RX 470 Black Edition is overclocked to 1256MHz and combines strong fansink cooling with 3x DisplayPort, HDMI, and dual-link DVI-D connectivity. It's ideal for overclocking, but expensive nonetheless. We can't think of a good reason to avoid it, but it suffers in comparison to slightly cheaper cards. A good alternative to the Gigabyte, but with just a few MHz in it, we'd save the £20!

**Where to get it:** Scan ([bit.ly/2bAXwI8](http://bit.ly/2bAXwI8))





## James Hunt offers up a selection of scientific shows

## The Infinite Monkey Cage

hear comedians and scientists joining the pair to throw their thoughts into the ring, informing and entertaining equally. Topics include everything from 'The Universe: What remains to be discovered?' and 'What happened before the big bang?', to 'Does science need war?', and 'What makes science a science?' – along with addressing the series' own long-running quandary: when is a strawberry dead?

slot afforded by the delivery method. It's even released a week earlier than the radio version, so digital listeners can feel especially happy. With 10 series covering seven years and numerous specials, there's plenty to listen to in the perpetually available archives. Its irreverent tone makes it accessible and engaging no matter how much you know about science, and it's a real jewel in the BBC's broadcasting crown, let alone the podcasting one.

**URL:** [tinyurl.com/ofsfldgz](http://tinyurl.com/ofsfldgz)

**Start With:** s6e02: *Science Mavericks* – covering the crazy ways scientists of the past made their discoveries and how that can inform the present.

## Radiolab

Produced by New York Public Radio and WNYC, Radiolab is a bit like *This American Life*, but for science and technology stories. Which is to say, almost universally brilliant and near-impossible to tear yourself away from once you've started listening. As well as field audio that allows you to hear people's accounts in their own words, the production usually includes experimental music that helps to aurally illustrate the concepts in a unique and high-concept manner. It doesn't just give you information you won't hear anywhere else, it does it in a way that makes for fantastic listening.

The hosts, Jad Abumrad and Robert Krulwich, have a fantastic dynamic, and although neither assumes the simple role of sceptic and believer there's always a lively debate about any topic. It has a broad focus, with everything from sociology to psychology to quantum physics or astronomy getting a look in, but it's always about the intersection between humans and knowledge, which makes it at once inspiring and emotionally affecting. It's so well-crafted, you won't believe it isn't free.

**URL:** [www.radiolab.org](http://www.radiolab.org)

**Start With:** s8e01: *Oops* – in which the plan to catch terrorists ends up creating one, protecting an endangered species ends up destroying another, and a lake accidentally becoming toxic creates new life.

## Startalk Radio

Hosted by the man who is undoubtedly America's most prominent science broadcaster – Neil deGrasse Tyson – *StarTalk Radio* is a fantastic, laid-back discussion and interview show that features some of the planet's greatest minds (not to mention the occasional

actors and celebrity) dropping in to discuss the biggest matters of the universe.

Although it's largely focussed on cosmology and astronomy, the show does manage to branch out into other topics too from time-to-time. So, you'll find podcasts on everything from the fight against Zika to the likelihood of there being water on Mars. The 'Cosmic Queries' editions are particularly great, presenting you with a grab-bag of science topics that are quickly explained by Tyson and his co-host, Chuck Nice.

There's a new episode every Friday, and old episodes are revisited every Tuesday, so you'll get a good spread of topics and plenty of material to keep you going. If you want to manually download older episodes you can buy an all-access pass, but with so much on offer you'll know well in advance if that's something that'll be worth the money.

**URL:** [www.startalkradio.net](http://www.startalkradio.net)

**Start With:** s7e20: *Unveiling Pluto* – which tells you everything New Horizons discovered about the Solar System's most popular dwarf planet, and asks whether it's even fair that it's no longer a planet.

## 60-Second Science

Not everyone wants to listen to incredibly long and involved discussions about scientific topics, and we get it. Sometimes, you just want a quick distraction. If that's you, the Scientific American team has the podcast you need: living up to its name, the 60-Second Science podcast is a daily, short-form dose of science where a professional scientist explains an important discovery or issue facing their field. Short and sweet is exactly right: most episodes clock under three minutes, so you're in no danger of running out of time to listen to them.

If there's anything bad about it, it's that sometimes you come away wanting a lot more than you got, but consider it a good way to get a crash course so that you can find out more yourself. The topics can veer from the esoteric (for example, 'Cut Road Deaths With Mountain Lions') to the far more mundane ('Farmed Trout Bred to Fatten Up Fast'), but when the topic is so short you'll always feel able to give it time. If nothing else, you won't hear some of these stories anywhere else because they're too small for some podcasts, so it'll complement your favourites well.

**URL:** [tinyurl.com/hg3afyd](http://tinyurl.com/hg3afyd)

**Start With:** July 4th, 2016: *Is Mars Missing A Moon?* – probably not a question you've ever thought about, but listen to this and you'll be able to sound smart when telling people the answer.

## The Naked Scientists

A co-production between the BBC and the University of Cambridge, this magazine show serves us pretty much everything you want in a science podcast: interviews, listener questions, prominent guest scientists, and a group of hosts who really know their stuff. It covers an eclectic range of subjects, too. Everything, from sections describing experiments you can do at home ('Kitchen Science') to in-depth discussions with the likes of James D. Watson, the man who co-discovered of DNA no less.

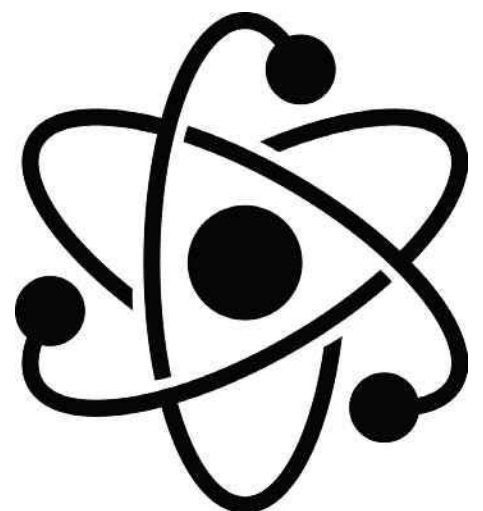
The show's episodes are released weekly. All of them hover around the hour mark time-wise, so there's a fair amount to listen to without it ever feeling as if it is becoming overwhelming.

The main features of recent episodes include 'The War On Salt', 'Will An Artificially Intelligent Robot Steal Your Job?' and 'Can You Boost Your Memory?', while smaller features cover things like whether giant pandas just don't feel like having sex and whether spoons can stop your wine going flat in bite-size segments. Broad in its coverage, and engaging in tone, there's a good reason it was saved from the axe by its fans a few years ago, and that it is still going strong even now.

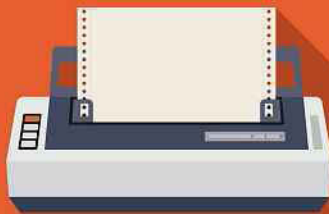
**URL:** [www.thenakedscientists.com](http://www.thenakedscientists.com)

**Start With:** *Drugs: Time For A Change?* – which examines both how drugs work, and how drugs policy works.

That's all for this month, but feel free to send in your favourites if you'd like to see them featured. Next month, we'll be looking at a range of downloads that cover storytelling as their topic. [mm](#)







# The Complete History of Home Computing

## Part 3

### James Hunt charts the technology explosion of 1979-81

**T**he third part of our complete history of home computing begins in 1979. Following the invention of the laserdisc and the release of the Apple II (one of those being slightly more crucial than the other) home computing was taking off – and things were getting serious...

#### 1979

As computers became more and more common in large institutions, the first programs emerged to exploit that. In 1979, at the Xerox Palo Alto Research Center, John Shoch and Jon Hupp would create

the first computer program that could spread and replicate itself. Designed to search the nascent Internet for idle computers so that their processors could be made use of, the program became invasive, inadvertently becoming the first viral worm – a term Shoch took from the 1976 sci-fi novel, *The Shockwave Rider*.

Not all software from this period is famous for being harmful, in that sense at least. Throughout 1979, gamers were enjoying *Space Invaders*, and later *Asteroids* – a pair of games that were the AAA console-sellers of their day. Atari's dominance of the console gaming market was strong, but their gaming PCs –

the Atari 400/800 – ended up as little more than footnotes. Meanwhile, four programmers sick of working for Atari formed their own company called Activision. In doing so, they created the first third-party games company.

Perhaps Atari's faltering in the PC market was because the competition was just too strong. In terms of home computing, 1979 is famous for three things: the 8088 CPU, the UK release of the Commodore PET, and the Motorola 68000.

## CPUs

Intel's 8088 CPU was based on the 8086 processor, and became the standard for the IBM-PC because of its 8-bit data bus, which made it cheaper to produce *en masse*. Meanwhile, rivals at Motorola were busy putting together the 68000, a chip that would later go on to power the Apple Macintosh, the Atari ST and the Commodore Amiga.

“ 1980 is all about one thing: the ZX80. The machine that the UK's software and games industry is based on ”

Interestingly, the selection of the 8088 wasn't what everyone wanted. Some engineers wanted to use Motorola's chip, or even a 6502, but Intel had secured the rights to manufacture 8086-based CPUs of its own. This decision, taken in the late 1970s, is the reason present day chips are still based on Intel's 8086-compatible architecture.

That's not to say the Motorola did badly. While it struggled to shift the 68000 at the start of its lifespan because it was just too expensive to use in home systems, it would achieve popularity in the mid-1980s – by which point the IBM-PC was well-established on its current architecture.

## The Internet

Few people would have realised at the time, but the Internet was starting to take its modern shape by the time we hit the late 70s. CompuServe was launched on September 24th, 1979, becoming the first commercial Internet service offering both email and technical support to its users. Likewise, Hayes released its first dial-up modem, a move that later ensured that all other modems would be marketed as 'Hayes-compatible' for some time to come.

Usenet was also invented in 1979, then launched in 1980. Developed by university students Tom Truscott, Jim Ellis, Dennis Rockwell, Steve Bellovin, and Stephen Daniel. Their concept would go on to be a popular way of connecting users and managing their discussions for over a decade prior to HTML and the invention of the web as we now know it, its hybrid style of discussion and email heavily influenced by the established BBS systems already in operation across the globe.

Although Usenet has latterly switched from its early use of UUCP traffic protocol to standard IP traffic, it still thrives today – or at least, survives today, because its peak is long behind it truth be told. It's unlikely that its dwindling user base would let Usenet simply shut down any time soon, but it's fair to say its staying power has been exhausted – though after 35+ years it seems like it had a good run!

## 1980

After being comparatively rare and niche throughout the 1970s, home computers were now being mass-produced – and, more importantly, mass-marketed. 1980 saw the release of two absolute giants of home computing.

### Commodore VIC-20

The VIC-20 was the first. A descendant of the Commodore PET, the VIC-20 was cheaper but more versatile, with a 1.2MHz MOS Technology 6502 CPU (actually 1.108MHz in the UK), 5k of RAM, and the ability to connect to a standard TV. Advertised in the US by no less than William Shatner, it was a hit, and the first computer of any description to sell a million units. By today's standards that probably seems tiny, but to Commodore it must've seemed incredible.

The key thing about the VIC-20 was its user-friendly design and low price. It also introduced a number of new concepts to home computing, which would go on to be standard, such as the 'datasette' tape interface, programmable function keys (a feature stolen from Japanese computers) and a full-size typewriter-style keyboard. Commodore also contracted Scott Adams to create a series of text adventures, helping to sell its ability as a machine for both business and pleasure.

Interestingly, there's some debate over what the actual meaning of the name is. It was sometimes assumed to be the text-width of the screen (though the VIC-20 had 22 columns, not 20) or that it was the combined size of its system ROMs. Commodore employees who were there at the time maintain it was simply because 20 was a friendly-sounding number, and that was the point of the VIC-20: to seem friendly. It worked, and although the system itself was only in production until 1985 it cemented Commodore's position as a leader in the home computing industry.

### Sinclair ZX80

Let's face it, though. 1980 was all about one thing: the ZX80. The machine that the UK's formidable software and games industry was built on. It was the first computer available in the UK for less than £100 (though accounting for inflation, it cost around £387 in modern money) and it shipped just 100,000 units before it was discontinued the following year – but that's an important 100,000 sales.

Based around existing chips, the only original parts of the ZX80 were its name (the 'X' was added into the Z80 chip's name to represent an unknown extra ingredient) and the firmware, which included its own BASIC interpreter. Despite its many flaws – it often overheated, the undersized membrane keyboard



▲ Intel 8088 CPU



▲ Commodore Vic-20

was terrible, and the screen flickered when it updated – it was huge in the UK. Though overseas success was elusive, it made the Brits into computer users. Its successors – and those of its competitors – owe the ZX80 a lot for the impact it made on the UK computer scene.

### The First Hard Drive

The other major development of 1980 was that Seagate created the first microcomputer hard drive: the ST506. Each disk held a positively colossal 5MB of data – as much as five diskettes – and the whole unit fitted in the space of a single floppy drive. Technically speaking, it was the same as modern hard drives, with a rigid metallic platter coated in a magnetic material that could store data.

It's fair to say it was a hit. Not only did it attract interest from Apple and IBM, it influenced the design of storage for years to come. It's only recently, with the release of SSDs, that primary computer storage has moved away from the Seagate ST506's fundamentals – and again, that's a good run by anyone's standards.

## 1981

Home computing kicked into high gear in 1981. Everything that came before it looked like a precursor to the arrival of some of the biggest and most transformative devices around.

For instance, hot on the heels of the hard drive came another new type of storage – although in this case, it was a floppy rather than hard disk. 1981 set the tone for almost the next 20 years of computing with the creation of the 3.5" floppy drive. Of course, in 1981 there were other contenders for the format – 3", 3.25", and even 3.9" – but it was the trusty 3.5" that won the format war, largely thanks to the momentum it gained after it was adopted by Hewlett-Packard as a standard in the following year.

1981 was also the year that the BBC debuted its new home computing series, *The Computer Program*, which was part of its Computer Literacy Project. Aiming to introduce interested adults to the world of computers, it directly inspired the creation of the BBC Micro, which was a home computer developed by Acorn so that viewers could follow the programme at home, and which itself helped inspire a mini revolution. In 1984, the first ever 3D game – *Elite* – was programmed the BBC Micro.

The big event of the year was that the IBM-PC, so long in the making, finally arrived on the scene. IBM's long-established brand recognition meant that when they released a home computer, people everywhere jumped at it. The IBM Model 5150

is the direct antecedent of every IBM-compatible in use today – and they'll probably remain the most popular style of desktop computer for decades to come. At the time, these PCs used a 4.77 MHz Intel 8088 processor and had a CGA video card, with a 5.25" disk drive as standard and the ability to include a second. It didn't contain a hard disk at all, though a later expansion added a 10MB unit. Sounds, of course, only came through the PC speaker. The default amount of RAM was 16k, though it could be expanded to a far more formidable 256k. All this could have been yours for just \$1,565.

The IBM Model 5150 also had one other quality in common with modern systems: it was powered by a Microsoft operating system. The original version of MS-DOS was created when IBM asked for an operating system to power its new PC. Microsoft spent \$75,000 buying the rights to an existing package – 86-DOS – and began modifying it to meet IBM's specifications. The resulting software (known as PC DOS 1.0 under license to IBM) would go on to power not just IBM's own PC, but virtually all IBM compatibles as well, until it was discontinued in the year 2000.

The growing computing ecosystem also brought with it the creation of new, third-party software and hardware manufacturers. The list of companies created in 1981 includes Creative Technology, Adaptec, Kensington, Logitech and Virgin Interactive, all of which are either still with us – or at least popular enough to be familiar to most computer users.

There's also one final, somewhat tragic footnote: 1981 saw the first confirmed gaming-related fatality, when 19-year-old Jeff Dailey died of a heart attack after hitting a Top 10 score of 16,660 on *Berzerk*. Bizarrely, *Berzerk* was apparently responsible for a second fatality one year later, when Peter Burkowski hit the top 10 twice in 15 minutes. You can play *Berzerk* online at [www.2600online.com/berzerk.html](http://www.2600online.com/berzerk.html) – though you do so at your own risk.

On that strange, sad note we come to the end of this month's instalment. Next month, we'll be looking at 1982-1985, featuring the Commodore 64, the Apple Macintosh and perhaps most excitingly, the first ever version of Microsoft Word... **mm**



▲ IBM 5150



# Remembering... TechNet Subscriptions

## We recall a time when Microsoft actually liked the SME and individual

For those of us that are small, medium or solo enterprises, Microsoft's TechNet subscription was blooming marvellous. For just £99 per year, more if you were interested in developer tools, you could have access to all the versions of Windows desktop, server, and special programs such as SQL, Sharepoint and BizTalk. Dig a little deeper into the TechNet subscription package and you would also find all the versions of Office, DOS up to 6.22, and even Windows 3 and 3.11 for Workgroups.

A paid subscription meant we could use any of these products within our test environment for as long as we wanted. We were supplied with keys, downloadable ISOs and the relevant documentation. There was once a time where you'd be sent over the actual discs, in a large blue folder – or several folders – for you to lock up in the safe.

TechNet subscriptions provided us with a gateway to Microsoft's products, to test each piece of software within our environment, to review it, and to see if it could fit the needs of our users. It was reasonably priced, rising to around £550 per year for the full developer package, and it worked a treat. You simply logged into the TechNet portal, picked through the products categories to find the software that you needed, downloaded and installed it, and it was yours to test and evaluate for as long as you needed it.

However, Microsoft in its wisdom decided to retire the TechNet service on August 31st, 2013 – with an extended period of ninety days for those with valid accounts at that time. The company basically pulled the rug from under the feet of the SME user, and

instead either had us use its 90-day free evaluation of a particular piece of software (as many of you know, ninety days isn't enough to run through a proper test of an operating system or server OS), or pay a King's ransom for the elevated MSDN subscription, which could be anywhere from £700 to £12,000 per month.

Were we happy? Nope. Did we have any choice in the matter? Absolutely not.

### History

TechNet Subscriptions were launched in 1998 to offer private users, and those with small companies, the opportunity to evaluate the company's latest software. Within a year, the service was extremely popular. It offered download links from the start (even on late-90s internet connections, these were often handy) or the option to have the physical discs. Prices didn't rise much over time, either, and remained a good option for someone who needed to test software. Imagine someone needing to test a server OS, the connecting desktop OS, and any specialist software; the total cost would quickly mount up. TechNet Subscriptions helped with this.

Sadly, the service was abused somewhat. We were probably all complicit, as the subscription license agreement dictated that TechNet Subscription software was entitled to be used by a single person – even if a large company bought it, it would have to allocate it to a single person, this was rarely the reality, though.

### Did You Know?

- According to Redmond Magazine, not everyone inside Microsoft was happy about TechNet subscriptions closing down either
- TechNet itself still exists; you can get hold of all manner of resources and advice within
- The lesser-known Microsoft Action Pack provides much the same service these days
- TechNet Subscriptions are slowly being replaced with Cloud-based, permanent access to OS and portal software

In view of this rampant license abuse, Microsoft decided to change the entire subscription model. Software now has a 90-days evaluation period, and if you want more than that you'll need MSDN. As such, August 2013 marked the end the TechNet, and the beginning of a continuing argument among IT professionals and the company.

### The Good

Access to Microsoft's software, for unlimited evaluation for very little.

### The Bad

License abuse from some users. [mm](#)



▲ Oh Microsoft TechNet subscriptions, how we miss you



▲ Ahh, Microsoft products on disc. Them was the days



▲ The TechNet Subscriptions portal, where you evaluate everything from DOS 5 to Windows 8.1

# RETRO ROUND-UP

This month we've got something different – a roundup of retro books as well as games...

Dave Edwards wallows in nostalgia and ire in equal measure

The retro gaming universe seems to be growing at a phenomenal rate. It seems that whenever it's time to round up what's happened over the past month, another ten people have jumped on the bandwagon.

As regular readers will be aware, I usually focus this column on new games for retro formats, but this month I'm doing something different: dedicating the first three-quarters of it to reviews of three very different book releases. These are all new, but very much connected to the machines of old – so, in my humble opinion, deserving of equal exposure here. In fact, I suspect much more work has gone into them than quite a few of the games that have graced these pages in the past.

Lest you retro gamers feel neglected, you can turn the page for a look at Revival Studios' *Mayhem* and *Avalanche* for the Vic 20.

## Diary Of An 80s Computer Geek

by Stephen Howlett

£4 ([tinyurl.com/horakds](http://tinyurl.com/horakds))

This 'diary' isn't so much a diary as it is a novella; I finished the whole thing in just over an hour. It is, however, a factual account of how one man's life was directly anchored by his exposure to 8-bit computers in the 1980s. Each chapter covers, broadly, what the author was doing in each year between 1982 (aged 13) and 1990 (aged 21).

While very personal, the book itself isn't presented with a great deal of care.

There's no blurb on its back cover, no page numbering and the Rubik's cube illustrating its cover isn't even mentioned in the prose. Spelling mistakes, grammar fluffs and lack of proofing are also in evidence too; for example, "it's" and "its" are confused throughout.

What I did like about the book itself, though, was Steven Howlett's decision

to write it entirely in the present tense (For example: "I wonder if there is an opportunity to have my own software on these cover tapes?"). This fits the diary theme, and sounds and is very conversational – it also helps with the biggest commodity this book has to play with: nostalgia. Using this tense is gently endearing, almost taking the reader back in time.

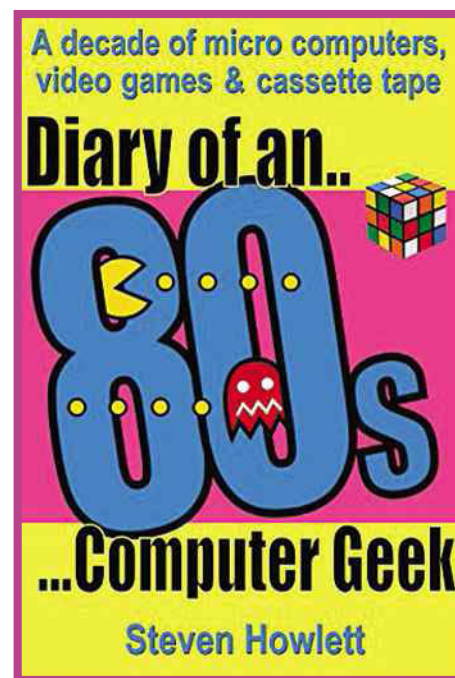
Having said that, there are a great deal of missed opportunities to really evoke the period in question. Each chapter begins with what might be termed 'context'; largely a 10-15 line news bulletin of the major events of the year. Yet this is largely unconnected to Steven Howlett's computing and coding 'adventures'. These adventures consist of being given his first ZX81, going to school (where he is told computers are not for him), going to college, working at a computer store and chasing the royalty payments for his first commercial game. These adventures are also recounted in a very factual way. The specifications of each machine he encounters fascinate him and the book sets these out in detail, but without passion.

The closest we come to any great subplot is when Howlett and school friends ask for permission to join the Computer Science class at his secondary school, which is curtly, and grossly unjustly, denied ("Without any discussion whatsoever, the mean-spirited old hag looked down her bigoted nose and tossed me and my classmates onto the IT scrap heap."). Later events lack any drama at all. Essentially all that happens in the whole book is that he writes a number of games, and very much enjoys doing so. Good for him, but not particularly dramatic for us.

In some respects, the 'diary' is insanely focused. For example, the only game that's mentioned is the arcade quiz machine, which serves as his inspiration

for the ZX Spectrum game *Snookered*. Those unfamiliar with the period in question therefore know from his news 'context' that lots of Americans are watching *Star Trek: The Next Generation*, yet have absolutely no appreciation of the capabilities of the competing games *Snookered* is going into competition with. In other respects, the 'diary' sometimes digresses into banal trivia for no reason ("An interesting item in the computer media reports that Apple Computer co-founder Steve Jobs has paid 10 million dollars to Lucasfilm to purchase the Special Effects Computer Group").

As a fellow Eighties schoolboy coder, I would have liked to have seen at least some description of the code he actually put together, not to mention more of the things he got up to when he wasn't



▲ Stephen Howlett recalls his years growing up with a Spectrum

programming in front of his black and white TV set. In relation to *Snookered*, we do at least get a chapter that goes into the creative process he employed – even if all we learn is that he did the graphics first and it took him six months to complete the whole thing.

His second game, *Ultimate Warrior*, barely receives any recognition in his own book at all. In fact, the first time we learn it even exists is when he submits it for inclusion on ZX Spectrum magazine *Crash's* covertape. When and how he wrote it is skipped entirely!

If there's any sort of grand moral to this story, it's only that, in the naivety of youth, he believes himself to have achieved some successes but, with the passage of time, realises these successes make little if any mark on the pages of history.

It is difficult to know for whom *Diary Of An 80s Computer Geek* is written. If, in the Eighties, you encountered the 'old school' teachers that barked at you rather than teach you; if you worked or visited computer stores; if you tinkered with Basic; or if you ran a mail order business from home, you might encounter the sweet smell of nostalgia reading about Howlett's life in that period.

As someone who experienced all four (and, contrary to what this review might suggest), I enjoyed reading it myself. However, I'm clearly exactly the type of person the book is aimed at, and if the above reservations are anything to go by, I would suspect anyone aged under 30 will find its lack of any real structure pretty unenthralling.

## The Story Of U.S. Gold

by Chris Wilkins & Roger M. Kean  
£20 (fusionretrobooks.com)

Times change, and yet some things remain constant. Pick up any old Eighties, Nineties or Noughties computer magazine and, sandwiched between advertisements for games, and reviews of them, you'll often find articles devoted to a particular publisher – Level 9, Superior Software, U.S. Gold. Except U.S. Gold wasn't just a publisher. It was also a developer, publisher, international distributor and multi-multi-million pound behemoth that dominated (at least initially) the Commodore 64, Amstrad and Spectrum software marketplace.

U.S. Gold did so much that it needed a book rather than a three-page feature to get through it all. So that's what Chris Wilkins & Roger M. Kean have written – *The Story Of U.S. Gold*.

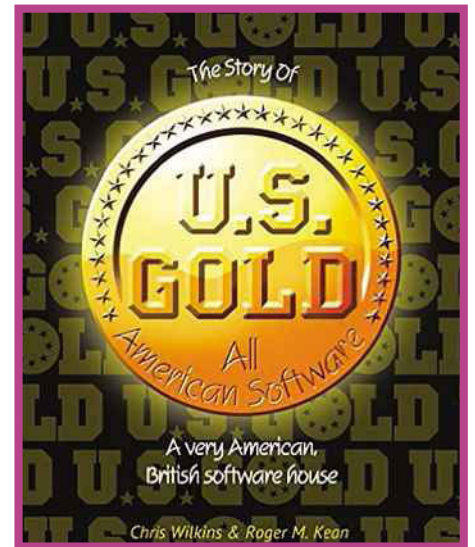
It weighs in at 236 pages, with a shiny golden cover embossed with the U.S. Gold logo. It's printed on glossy pages and liberally illustrated with hundreds of game screenshots, photographs, and adverts from the period (approximately 1982–2002), which it covers in detail. So, if your favourite retro computer was available during that time it will certainly figure somewhere in the book's narrative.

And what a narrative it is! Part biography, part business manual, part nostalgia fix and several other parts indescribable, it portrays the people who ran U.S. Gold as ballsy, ruthless (and on some occasions foul-mouthed) businesspeople that attacked the rather staid British software scene with quality American products – and did so with all the subtlety of a sledgehammer.

The first thing you notice about the story itself is that it isn't divided into chapters. Every few pages, there may be a subheading that will give stalwart retro gamers a clue as to what particular part of the saga comes next but, in many respects, it reads more like an essay than a story.

This disjointed nature is added to by the fact the book is split almost evenly into two very different halves. A 'what happened in what order' section, takes up just the first 117 pages, while the remainder is filled with articles of different lengths – everything from the art of U.S. Gold's loading screens to how the music was composed for various titles, and by whom. I quite liked this division, though, mainly because I found the recollections of some of the principal players rather too arrogant for my liking. The articles at the back are written with much more humility. They're also shorter and more focussed, making them much more interesting to read – and you can quite easily pick out the subjects (or authors) who interest you the most.

*The Story Of U.S. Gold* is a brave attempt to tell the definitive story of a business at the top of its game. It's comprehensive and immaculately presented, and will no doubt find a place on many coffee tables. If I were to sum up that story in a single sentence, it would be: "The story of how we were the first to buy software from the US and sell it to Europe, and how we were able to stop anyone else being able to do anything similar for twenty years." Within these pages is a story of remarkable business nous, foresight and luck – the book simply tells it like it is, and as it happened.



▲ How they pulled out all the stops to make themselves millionaires

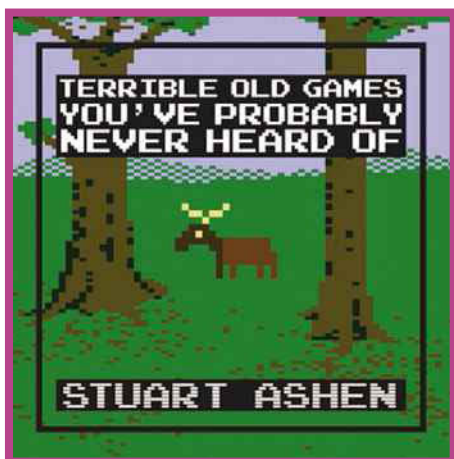
To what end, though? I'm not exactly sure. As an example, consider its section on the *World Cup Carnival* saga – an outrage that occurred across multiple machine formats and involved tens of thousands of gamers being ripped off by U.S. Gold in the mid-Eighties.

The story goes as follows: U.S. Gold licensed the official *World Cup Carnival* name. However, it needed to get a game with that name on the shelves quickly to capitalise on the surrounding football fever. It promptly acquired Artic Computing's *World Cup Football* (a rubbish three-year-old game) and threw it, some stickers, and a wallchart in a very attractive-looking box, and didn't send out any copies for review – instead investing even more heavily than usual in marketing its amazing 'new' title.

The game sold in its tens of thousands and, whilst it immediately attracted the ire of reviewers, wholesalers and buyers alike, there was no noticeable effect on subsequent sales revenue for U.S. Gold to ponder. So apparently, that was all right then. Consider Tim Chaney's current thoughts on this definitive account of one of U.S. Gold's not-so-finest hours: "World Cup Carnival was a masterpiece of packaging, it was a masterpiece of marketing... And we were big enough that we could stiff everyone and come back afterwards and say, 'sorry about that. Here's a new game'."

You may think that all the people reading his thoughts who shelled out £10 for that game back in the day, might they expected an apology for that after all these years? No chance.





▲ *Ignorance is sometimes bliss, though...*

This is the problem with large swathes of *The Story of U.S. Gold*. We clearly owe the company a great deal of respect, and a modicum of gratitude, for bringing us so many games that we remember fondly from our formative years. The trouble is, this extremely detailed account of how rich they made themselves and how they did it isn't particularly endearing – or indeed interesting. Even if you didn't buy *World Cup Carnival* and you were U.S. Gold's biggest fan prior to reading this, the lack of humility will take the story somewhere you'd probably rather it didn't.

What's worse still, is that in the story part of the book the style of writing mirrors precisely how U.S. Gold actually operated – it's dry, humourless, direct, factual, and wholly unapologetic. The sad fact is that I doubt I'll ever re-read it, which is often the charm of a book that looks as nice as this; I'll probably just stick to the second part, with its articles describing the wonderful games U.S. Gold brought to our shores instead.

U.S. Gold made millions at the time, and the book explains how. However, for all its wonderful presentation, I'm afraid the story and its personalities left me cold.

## Terrible Old Games You've Probably Never Heard Of

by Stuart Ashen

£10 ([tinyurl.com/hwrl28w](http://tinyurl.com/hwrl28w))

Some games rock and some games suck. Stuart Ashen's little hardback book is a collection of reviews of those that fall firmly into the latter category (the title is nothing if not literal). What you get in exchange for a crisp £10 note is a collection of reviews of commercial games that were terrible on release and remain terrible now.

What does this mean? Is this book a depressing, and largely irrelevant collection of game-hate or will the author's almost psychotic, yet completely genuine, indignation at each of its featured games have you clutching your sides with laughter whilst tears stream uncontrollably down your cheeks? Well, let's see...

The book is produced to a high standard, with glossy pages, very clear text, screenshots and relevant composite images that help to illustrate points made in the text. You don't just get a diatribe of derision about the downright absurd 'fighting moves' from Amiga CD32 game *Dangerous Streets*, you get nice pictures of the moves laid out in all their baffling, bewildering glory.

The games featured are format-specific (for example, *Graffiti Man* for the Atari ST, *Show Jump* for the Dragon 32, *Licence To Kill* for the Acorn Electron, etc). Each review is mercifully only six pages long and the 'pocket-book' layout size means that equates to only a few hundred words. Each game it features also ends with a bullet point epilogue letting you know if the game was released for alternative machines or in any better (and in some cases, even worse) versions.

If you think of each game review as a chapter, there are twenty. They sit alongside a small number of interviews with Youtubers who regularly create

game-related content slipped between the chapters like booky Easter Eggs. Most chapters are written by the author, apart from the one decrying Mastertronic's *Los Angeles SWAT* (for the Amstrad CPC) written by 'Guru' Larry Bundy Jr, the man behind the beloved *Fact Hunt* series of videos that pop up on YouTube on practically every search for retro games.

Now, with the Internet (and especially Amazon) awash with reviews of bad games, and with characters such as The Angry Videogame Nerd practically rupturing his spleen talking people through games like *Big Rigs*, you may wonder if there's really a market for a full-price book of similar reviews. In my opinion (and it is only an opinion), reviews of bad games succeed or fail solely based on the author's real (or perceived) indignant loathing of the item in question. As an example, I regularly re-read the reviews Richard Cobbett wrote about *Granny's Garden* ([tinyurl.com/hw75dje](http://tinyurl.com/hw75dje)) and *Hopkins FBI* ([tinyurl.com/zf3g28d](http://tinyurl.com/zf3g28d)), and they never fail to have me laughing so hard that my girlfriend quickly retrieves my medication before I do myself an injury.

The comedic over-exaggeration of the flaws of an average game, as present in those free reviews, personally tickled me more than this book's blow-by-blow accounts decrying every terrible factor of terrible old games I'd never heard of. That's not to say I didn't laugh at all – I did. Humour and vitriol are certainly there (For example, "The animation is beyond laughable, to the extent that you begin to wonder if the movements were designed by a primitive computer that had human motion explained to it by a semi-comatose drunkard"). I just didn't laugh as hard as I do when reading about *Hopkins FBI*, or watching Larry Bundy Jr's Youtube videos.

That criticism aside, this is a very good book for anyone who plays or collects videogames with not a spelling



▲ *It's a jungle out there...*



▲ *The Vic 20 doesn't do loading screens*



▲ *Under attack! The yellow blob is a coin*



▲ *Avalanche* – a game of descending gems



▲ Time to dig out that Vic joystick for some lo-res, retro arcade fun – no snow, though



▲ Change your ship's symbol to match those descending towards you

or grammar fluff in sight. There seems to be at least one review of one terrible game for every machine format on sale between 1980 and 1995. Considering this period was my golden age of gaming, I'd actually already played four of the games I was supposed to have never have heard of. It was a strangely cathartic experience; while reading these particular chapters, I had the feeling that someone taking the time to let the world at large know just *how* bad these games were was actually righting some decades-old injustice.

The book is available via Amazon, but was originally crowdfunded via Unbound (see link). Interestingly, Unbound is currently seeking to raise additional pledges for a book on *The Secret History of Mac Gaming*.

## Revival Studios

To round off our round-up this issue, I'm taking a look at two more of Revival Studios ([revival-studios.com](http://revival-studios.com)) 'simple but fun' games for the Vic 20. Both *Mayhem* and *Avalanche* are available either as digital downloads or on physical cassettes but, if you're in any way familiar with other Vic 20 games you'll have a fair idea of what "an arcade game for the unexpanded Vic 20" means in practice: not a lot.

However, despite the simplistic gameplay of both of them, they are put together with a finesse that means they shouldn't just be dismissed out of hand.

## Mayhem

**Commodore Vic 20, Revival Studios**  
**£10 ([revival-studios.com](http://revival-studios.com))**

In the case of *Mayhem*, you are presented with a large blank arena, bordered on all sides by a blue wall. Inside the arena sits Wizzy, a bloke who looks remarkably like he just came off the worst from a nasty fight with a car-crusher. Despite that, he's a nimble little fellow who can scoot around

the arena at supersonic speeds and in one of eight directions.

That's handy, because ping-pong off the walls of the arena are a number of balls, beginning with a single one. These always fly diagonally and at the same momentum. Your job is to avoid coming into contact with any of them for as long as you can. One coin at a time appears within the arena and each time you collect a coin, your score increases. The number of balls you must avoid steadily increases throughout the game. Still in the dark? If you're familiar with *Arkanoid* – or the Bushnell/Jobs/Wozniak Atari classic *Breakout* – then imagine that game, but without the bat, and with you in control of one of its blocks and the object being to avoid the ball. You got it now.

As games for the unexpanded Vic go, it's actually pretty good and, with only 3.5K to play with, it probably loads faster than the average PS3 disc. Collision detection is good and it's a challenging play.

## Avalanche

**Commodore Vic 20, Revival Studios**  
**£10 ([revival-studios.com](http://revival-studios.com))**

The name *Avalanche* conjures up mental images of a game featuring skiers and snowy mountains, so it's something of a surprise to find that this contains neither. Instead, it's raining gems inside your Vic 20, and you must prevent any of them from crossing the horizontal line at the bottom of the screen.

You make these tumbling gems disappear by shooting them with your infinite supply of bullets. The problem is that, unless you match the symbol on your ship with the symbol on the gem before you shoot at it, your bullet will have no effect. So the race is on to flip your ship to the correct symbol (There are five possibilities), duck underneath the gem

'column' closest to the horizontal line and ensure that gem eats lead.

You only have a single life and, if any gem, crosses the line that's game over.

As *Avalanche* progresses, it gets progressively faster, of course. Something I quite liked about playing it is that, for the first thirty seconds or so, it really does seem to be quite easy – you'll be shooting those gems out of the sky long before they get anywhere near the point of no return. However, the Vic 20's screen, by its very nature, is extremely small and it only takes a short speed increase before gems that only seconds earlier were only making it halfway down the screen are suddenly able to reach spitting distance before biting the dust.

It all moves along in a pleasingly speedy manner and, whilst being an extremely simple game, is surprisingly addictive.

## Verdict

I quite enjoyed both of these simple Vic 20 games. In fact, there's little to criticise them for... apart, that is, from the £10 price tag. Revival has now produced six individual Vic 20 titles, and each of them is good in its own way – but, unfortunately, not good enough to warrant that sort of money.

It occurs to me that they would have worked much better as a compilation. In fact, all six of them load so quickly that they would probably all fit on a single C15 cassette too.

Having said that, they must be popular as there are only very limited stocks of both games left, so if you believe Vic 20 games might one day fetch big bucks, they could be worth an investment.

## That's All Folks!

I hope you enjoyed this slightly different Retro Round-up. Next month, we'll be back with reviews of more games. See you in four issues time. **mm**

# Have Social Media Rivalries Halted Innovation?



Caroline Preece wonders if social media is about to eat itself



**M**ost of us have at least one social media account, whether it's for work or for keeping in touch with friends and family. However, while the last decade has seen an ever-increasing range of options when it comes to broadcasting the details of our lives, frequent accusations that Facebook is taking 'inspiration' from Twitter, and Twitter from Instagram, and Instagram from Snapchat, and so on, calls into question whether any of them is actually offering anything new.

Social companies are constantly fighting to capture our collective attention by any means necessary. On a corporate level, the structure of many of these platforms – via which brands and digital influencers have the power to recommend products to their followers – means that they are hugely valuable to marketers. It's the ultimate in targeted advertising – get real people who are trusted by a massive following, and have them endorse your product. In the process of perfecting this model, social media has helped break down the traditional barriers between 'known' and 'unknown' people.

As with many a phenomenon organically grown from public interest, big companies want a piece of the marketing pie. The first phase of this was to plant advertisements within seemingly natural posts, thus cashing in on the trust of the audience, but now social media channels are trying to openly cater for these digital natives, and it's the battle for the best way to do this that in potentially leading the whole social media market into crisis.

## Winners And Losers

Snapchat – one of the newest, most notable players to enter the arena – has found success by targeting the younger generation directly. Unlike the multi-generational friendliness of Instagram or Facebook, from the very beginning Snapchat actively distanced itself from established channels by making everything temporary – this is social media for the people for whom social media is a 24/7 activity. By design it is difficult to use if you're constantly checking for updates; once something is viewed, it quickly expires and disappears. Like ads, it leaves an impression because it's temporary yet delivered through a medium that's increasingly ever-present.

There are currently 10 billion mobile videos viewed through Snapchat per day, according to Statista, and it is the most popular social media site among teenagers and young adults in the US. In short, Snapchat has posed a significant problem for its peers, and they're playing catch-up.

Of course, Facebook isn't in real trouble – far from it. According to forecasts from eMarketer, more than 50% (162.9 million) of Americans will log on to the site at least once a month in 2016, up from 49% the year before. It is the dominant social network, and will remain that way until at least 2020. The second most used social network in the US is also Facebook-owned. Instagram will see 89.4 million US users log on in 2016, eMarketer's figures suggest.

The issue here is Generation Z – the post-millennial generation – among whom use of Facebook is in decline. According to eMarketer, while young people still use it on a regular basis, growth is slowing among these groups. Statista puts Facebook's users aged 13-19 at just 8% of its total. This means that, while it rules the roost when it comes to mobile advertising and public knowledge, in comparison to Snapchat, Facebook is the becoming the middle-aged guy trying to keep up with what the kids are into.

## Lifestage

Available in the US from late-August, Lifestage – Facebook's new 'selfie sharing app' – aims to take its original purpose of connecting University students and skew it even younger. According to the company, it makes it "easy and fun to share a visual profile of who you are with your school network", and you won't even need a Facebook account.

If the mission statement wasn't enough of a tip-off, then the presence of cute animations should immediately remind you of Snapchat. In many ways, it's the ultimate sharing tool for Gen Z – nothing is private and you can be sure that everything posted will travel beyond the real-world boundaries of your school network.

This is either a bold stride into the future or the latest sign of the old guard of social media scrambling for relevance. Facebook has been pushing video content for some time, tweaking its timeline algorithm to prioritise visual content over text and video over images, but this goes a few steps further.

It's worth noting that Facebook tried to acquire Snapchat for \$3bn back in 2013, and that Lifestage is not the first spin-off venture to have echoes of the rival app. The company launched Slingshot back in 2014, featuring ephemeral messages, but it flopped. Instagram, recently debuted 'Stories for Instagram' – similar in both name and function to Snapchat's Stories feature. With it, users can create slideshows of photos and videos that play consecutively and disappear after a 24-hour period.

## 'Who I Am'

This is not a new thing – digital language brought into use by one social media channel, such as hashtags, is now used by all. Twitter and Instagram have been experimenting with timeline ordering by relevance, rather than chronologically, for years and Twitter already has a Snapchat-esque 'Moments' function. Not immune, Snapchat recently introduced a way to save photos – sidestepping its unique selling point.

The biggest difference in this case, is the person behind Lifestage – 19-year-old Michael Sayman, who began coding at 13. This is very smart on Facebook's part – enlisting the expertise of an actual teen when attempting to recapture the attention of his own generation – and is yet another sign that users have overtaken companies when it comes knowing what they want.

"Back in 2004, Facebook was all about 'who I am'," said Sayman. "I could post my relationship status. I could share what my favourite music was. And it was all about expressing myself.

"Today as Facebook has grown into so much more, we see the opportunity to explore that concept of 'who I am' once again, but for Generation Z in 2016."

As much as attention has focused on the app's similarities to Snapchat, I'd argue that it's also rather retro. Those old enough to have used MySpace in its day will remember how important things such as music tastes and the 'who I am' concept was to back then. Have things just come full-circle? Have social media companies tried so hard to offer up fresh solutions only to end up right back where they started? Has increased competition actually stalled innovation?

The current generation of coveted 12-24-year-olds have taken the 'personal branding' angle, usually associated with working professionals, and honed it from childhood. It's doubtful that in 10-20 years we'll see people networking on sites such as LinkedIn, and far more likely that professional and personal connections will be made through platforms like Snapchat, as lines continue to blur between what's personal and what's for public consumption.

The sheer influx of options means that people can put their personalities online and become viewable from every angle – and companies are battling to become the hub for this generation of self-promoting consumers. However, by trying to catch-up with apps offering entirely different experiences, there's a danger that social media channels could end up cannibalising each other instead of moving forwards.

With competition comes disruption, and only time will tell whether Facebook, Snapchat, one of their many rivals, or something totally new, will end up on top. [mm](#)



# Make Your Own Hex Viewer

**Mark Summerfield** creates a useful visual tool using Python

Sometimes it's useful to see the raw bytes in a file and, for files that contain text, to see what those bytes look like as characters in various different encodings. In this article we'll review a complete Python GUI program – short enough to type in – that provides this facility and shows how easy it is to create small graphical tools using Python's built-in tkinter library.

All the code should be put in a single plain text file called, say, `hexview.pyw`. The file could be created by the IDLE editor (which comes with Python – just click File > New File), or with notepad (although I recommend the free, and far superior, Notepad++ on Windows), or any other modern Python-savvy code editor or IDE.

We'll review the application's code in order from beginning to end, and so we will start with the imports.

```
#!/usr/bin/env python3
import os
import sys
import tkinter as tk
import tkinter.ttk as ttk
import tkinter.filedialog as filedialog
```

Most GUI libraries have so many components that people often use star imports, for example: `from tkinter.ttk import *`; `from tkinter.ttk import *`. However, I prefer to simply use shorter names (`tk`, `ttk`, and `filedialog`) so that I can see what comes from where. Incidentally, the first line is just a comment – but one that is used to determine which Python to use. So, while not strictly necessary, I recommend always starting with it, even on Windows.

```
APPNAME = "Hex View"
BLOCK_WIDTH = 16
BLOCK_HEIGHT = 32
BLOCK_SIZE = BLOCK_WIDTH * BLOCK_HEIGHT # 512 bytes
ENCODINGS = ("ASCII", "Latin1", "UTF-8", "UTF-16")
```

These are the constants we'll need. The application will show 512 bytes at a time from a given byte offset using two-digit hex numbers (00-FF) for each. It will also show those bytes as text using a user-specified encoding. Python supports lots of text encodings: here we've just put in some common ones, but you can add as more as you like.

The application's functionality is encapsulated in its `MainWindow` class, which we'll review method by method.

```
class MainWindow:
    def __init__(self, parent):
        self.parent = parent
        self.create_variables()
```

```
self.create_widgets()
self.create_layout()
self.create_bindings()
if len(sys.argv) > 1:
    self._open(sys.argv[1])
```

When a `MainWindow` is created we store the parent that's passed in and then use separate methods to set up various aspects of the user interface. At the end we check to see if a filename was given on the command line (`sys.argv[0]` contains the name of the program, `sys.argv[1]` and so on – if present – contain the command line arguments), and if an argument is given, we assume it is a filename and attempt to open it using the private `MainWindow._open()` method shown later.

Note that the `__init__()` method – and all the methods that follow it (those whose first argument is `self`) – should be indented under the `MainWindow` class declaration.

```
def create_variables(self):
    self.filename = None
    self.offset = tk.IntVar()
    self.offset.set(0)
    self.encoding = tk.StringVar()
    self.encoding.set(ENCODINGS[0])
```

We keep track of the name of the file we're showing using a normal string. But for the offset and encoding we create an `IntVar` and a `StringVar`. These are special tkinter-specific types that hold a value (an int and a str) which is set using a `set()` method and retrieved using a `get()` method. We'll see shortly why we need to use these types.

```
def create_widgets(self):
    self.frame = tk.Frame(self.parent)
    self.openButton = tk.Button(self.frame,
                                text="Open...", underline=0, command=self.open)
    self.offsetLabel = tk.Label(self.frame,
                                text="Offset", underline=1)
    self.offsetSpinbox = tk.Spinbox(self.frame,
                                    from_=0, textvariable=self.offset,
                                    increment=BLOCK_SIZE)
    self.encodingLabel = tk.Label(self.frame,
                                   text="Encoding", underline=0)
    self.encodingCombobox = tk.Combobox(self.frame,
                                         values=ENCODINGS, state="readonly",
                                         textvariable=self.encoding)
    self.quitButton = tk.Button(self.frame,
                                 text="Quit", underline=0, command=self.quit)
    self.create_view()
```





The user interface has an outer frame (the visible window) which contains a couple of buttons (Open and Quit), some labels, and a spinbox and a combobox. Every widget must have a parent (given as the first argument to its constructor). Widgets from the `ttk` module are styled to look native, unlike those from the `tk` module, so we prefer `ttk` widgets where available.

There are more `ttk` widgets than `tk` ones, with most `ttk` widgets superceding existing `tk` ones of the same name, and some entirely new `ttk` widgets not present in `tk`. However, there are still a few `tk` widgets that have no `ttk` equivalents.

When a button is clicked, the function or bound method given as its command will be called. If an underline is specified, Tk will underline that character (e.g., the 'O' in "Open" and the first 'f' in "Offset").

These underlines are used as visual cues telling the user that a press of `Alt+underlined_letter` will perform an action. In the case of a button, the press should have the same effect as clicking – but we must program the behaviour ourselves, as we will see in the `create_bindings()` method.

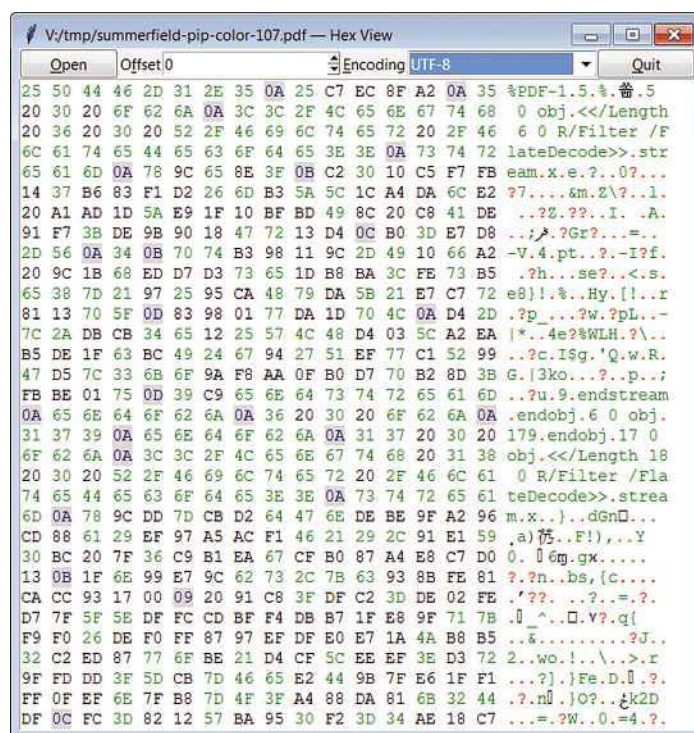
The spinbox's textvariable is set to the `self.offset` (of type `tk.IntVar`). This means that if we change `self.offset` programmatically (by calling `self.offset.set()`), the value set will automatically be reflected in the spinbox – which is why we needed to use a `tk.IntVar` rather than a plain `int`. Correspondingly, if the user interactively changes the value in the spinbox, the value they set will be reflected back into the `self.offset`. In other words, the spinbox and its textvariable (`self.offset` of type `tk.IntVar`) are automatically synchronized. The same principle applies to the combobox and the `self.encoding` (of type `tk.StringVar`) – except that here a string is used rather than a number.

```
def create_view(self):
    self.viewText = tk.Text(self.frame,
        height=BLOCK_HEIGHT,
        width=2 + (BLOCK_WIDTH * 4))
    self.viewText.tag_configure("ascii",
        foreground="green")
    self.viewText.tag_configure("error",
        foreground="red")
    self.viewText.tag_configure("hexspace",
        foreground="navy")
    self.viewText.tag_configure("graybg",
        background="lightgray")
```

Tk provides a `tk.Text` widget, which can display styled ("rich") text. It is possible to make a `tk.Text` widget support styled text editing up to a point, but I've certainly never found a way to turn it into a fully fledged styled text editor. Furthermore, `tk.Text` has no built-in support for reading or writing styled text. Both can be done using say, HTML, but we'd have to write our own code to do it.

We can add as many tags as we like to a `tk.Text` widget, each with a unique name (e.g., "error"), and with any number of configurable properties. Here we just set colours, but it is possible to set font attributes too. The tags themselves do nothing unless applied to inserted text as we'll see further on.

```
def create_layout(self):
    for column, widget in enumerate((
        self.openButton, self.offsetLabel,
        self.offsetSpinbox, self.encodingLabel,
        self.encodingCombobox,
        self.quitButton)):
        widget.grid(row=0, column=column,
            sticky=tk.W)
```



```
self.viewText.grid(row=1, column=0,
    columnspan=6, sticky=tk.NSEW)
self.frame.grid(row=0, column=0, sticky=tk.NSEW)
```

Tkinter has various layout managers, but the easiest to use is `grid`. Here we've put almost all the widgets as a single row along the top and then put the `self.viewText` (of type `tk.Text`) below and set it to fill the frame it is contained in (apart from the row of widgets above it). At the end, we tell the containing frame to fill the application's window.

```
def create_bindings(self):
    for keypress in ("<Control-o>", "<Alt-o>"):
        self.parent.bind(keypress, self.open)
    for keypress in ("<Alt-q>", "<Escape>"):
        self.parent.bind(keypress, self.quit)
    self.parent.bind("<Alt-f>",
        lambda *args: self.offsetSpinbox.focus())
    self.parent.bind("<Alt-e>",
        lambda *args: self.encodingCombobox.focus())
    for variable in (self.offset, self.encoding):
        variable.trace_variable("w",
            self.show_block)
```

Apart from the last loop, this method is used to create keyboard bindings. The first two allow users to press `Ctrl+O` or `Alt+O` to click the Open button, and the second two let users press the Quit button by pressing either `Alt+Q` or `Escape`. If the user presses `Alt+F` we give the keyboard focus to the offset spinbox, and if they press `Alt+E` we give the focus to the encoding combobox.

After the user has clicked Open and chosen a file to view, we show the file's first block using the current encoding. If the user wants to view another block or change the encoding they can use the spinbox and combobox. This works because in this method's last loop we have told Tk that whenever a new value is written to the `self.offset` (`tk.IntVar`) or `self.encoding` (`tk.StringVar`) using their `set()` methods, Tk should call the `show_block()` method.





```
def show_block(self, *args):
    self.viewText.delete("1.0", "end")
    if not self.filename:
        return
    with open(self.filename, "rb") as file:
        try:
            file.seek(self.offset.get(),
                      os.SEEK_SET)
            block = file.read(BLOCK_SIZE)
        except ValueError: # empty offsetSpinbox
            return
    rows = [block[i:i + BLOCK_WIDTH] for i in
            range(0, len(block), BLOCK_WIDTH)]
    for row in rows:
        self.show_bytes(row)
        self.show_line(row)
    self.viewText.insert("end", "\n")
```

This method (and its helpers, below) is the heart of the application. It begins by deleting all the text in the self.viewText widget (from line 1, column 0 to the end – the widget uses 1-based line numbers and 0-based column numbers). If there's no filename, we're done. Otherwise, we open the file in read-only binary mode, seek to the given byte offset, and read up to one block (512 bytes).

Once we have the block, we need to split it into rows, each one containing BLOCK\_WIDTH bytes. This is done in a single statement (rows = ...) where we step through the block from beginning to end in BLOCK\_WIDTH steps and creating a list of bytes objects (i.e., read-only bytearrays) of BLOCK\_WIDTH bytes using a list comprehension.

Alternatively we could have done: rows = []; for i in range(0, len(block), BLOCK\_WIDTH): rows.append(block[i:i + BLOCK\_WIDTH]).

At the end of the method we iterate over each row and show its bytes followed by the decoded text represented by those bytes in the self.viewText widget, and finish by adding a newline.

Is it inefficient opening the file every time we need to show a 512-byte block, and then closing it again? In theory, yes, but in practice it doesn't matter. First, because a modern operating system will read not just 512 bytes, but a bigger chunk (4K, 8K, 16K or more), and this will stay in a RAM buffer so most subsequent calls will be to RAM not disk.

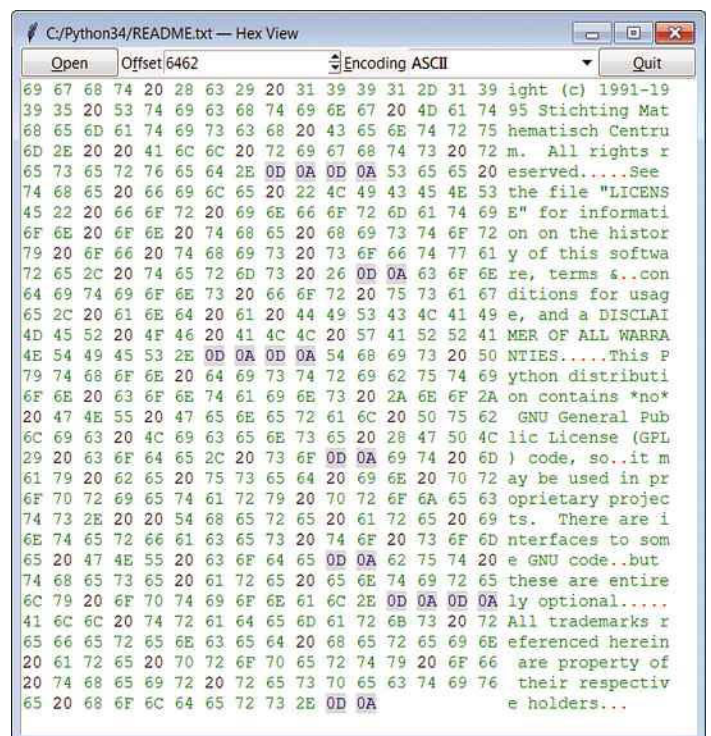
Second, even if we set an offset that's outside the buffer and require a fresh disk read, by the time the user has finished changing the spinbox's offset (e.g., by pressing and releasing the Up arrow key, or by entering a number), the computer has about 200 milliseconds to respond before the user will notice any delay. This is far more time than is needed to do a disk read (even from a physical spinning disk), and repopulate the self.viewText tk.Text widget.

```
def show_bytes(self, row):
    for byte in row:
        tags = ()
        if byte in b"\t\n\r\v\f":
            tags = ("hexspace", "graybg")
        elif 0x20 < byte < 0x7F:
            tags = ("ascii",)
        self.viewText.insert("end",
                             "{:02X}".format(byte), tags)
        self.viewText.insert("end", " ")
    if len(row) < BLOCK_WIDTH:
        self.viewText.insert("end",
                             " " * (BLOCK_WIDTH - len(row)) * 3)
```

This method iterates over every byte in the row it is given, and adds each one to the self.viewText widget. If the byte is whitespace or in the printable 7-bit ASCII range, we add suitable tags for colouring the foreground and/or background. We insert each byte as a two-digit uppercase hexadecimal number with the formatting tags followed by a plain unformatted space. If there are less than BLOCK\_WIDTH bytes (e.g., the last row of the file), we pad with spaces allowing three per byte, two for the hex digits, and one for the following space.

```
def show_line(self, row):
    for char in row.decode(self.encoding.get(),
                          errors="replace"):
        tags = ()
        if char in "\u2028\u2029\t\n\r\v\f\uFFFF":
            char = "."
            tags = ("graybg" if char == "\uFFFF"
                   else "error",)
        elif 0x20 < ord(char) < 0x7F:
            tags = ("ascii",)
        elif not 0x20 <= ord(char) <= 0xFFFF:
            char = "?"
            tags = ("error",)
        self.viewText.insert("end", char, tags)
    self.viewText.insert("end", "\n")
```

After writing the bytes in hex, this method is used to write them as text. We decode the bytes into characters using the encoding set by the user, replacing any that can't be decoded by the Unicode U+FFFD replacement character. If the character is a Unicode whitespace or the replacement character, we represent it with a full-stop and also set a tag colour. If the character is outside the Basic Multilingual Plane (BMP), we represent it with a question mark and set the error tag colour (Python strings can handle all Unicode characters, but unfortunately tkinter widgets are limited to those in the BMP). Once we have the character to display and its tags, we insert it into the self.viewText widget. And after all the row's characters have been inserted, we insert a newline ready for the next row.





```
def open(self, *args):
    self.viewText.delete("1.0", "end")
    self.offset.set(0)
    filename = filedialog.askopenfilename(
        title="Open — {}".format(APPNAME))
    self._open(filename)
```

When the user clicks the Open button this method is called. It starts by clearing the `self.viewText` widget and then sets the offset to 0.

It then pops up the platform-specific file open dialog and then calls the same private `MainWindow._open()` method that we saw called in the `__init__()` method.

```
def _open(self, filename):
    if filename and os.path.exists(filename):
        self.parent.title("{} — {}".format(
            filename, APPNAME))
        size = os.path.getsize(filename)
        if size > BLOCK_SIZE:
            size -= BLOCK_SIZE
        elif size > BLOCK_WIDTH:
            size -= BLOCK_WIDTH
        self.offsetSpinbox.config(to=size)
        self.filename = filename
        self.show_block()
```

This method begins by checking to see if the filename it was given is non-empty (and not `None`) and exists in the file system. If these checks pass, the method next updates the application's title to include the filename.

It then computes the maximum offset to allow – a value that will be less than the number of bytes, so that if the user runs the spinbox to its maximum some bytes from the file will still be visible. Then the filename is stored, and `show_block()` is called to show the file's first block.

```
def quit(self, event=None):
    self.parent.destroy()
```

If the user clicks the Quit button (or clicks the window's X close button), this method is called. It tells the parent (the app variable) to destroy itself leading to a clean termination. This is the last `MainWindow` method.

The final few lines are top-level, that is, not indented at all.

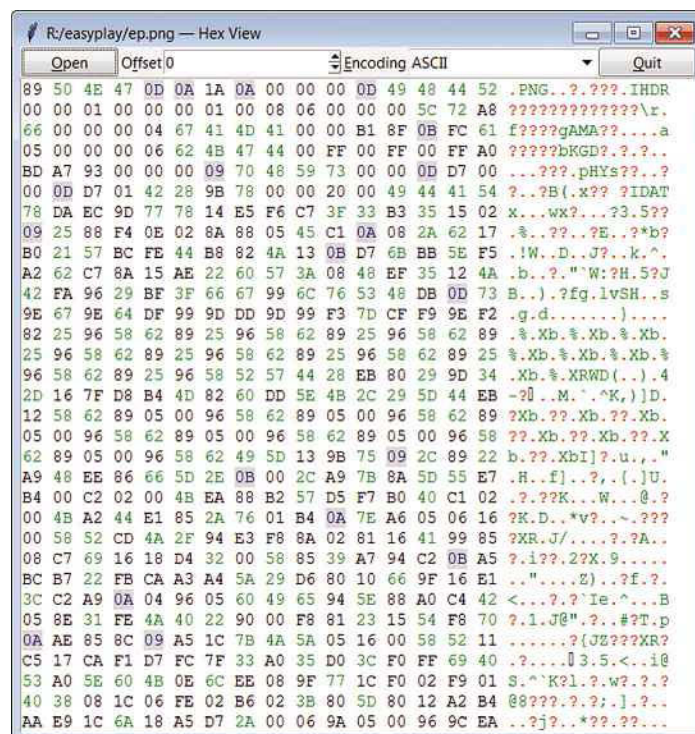
```
app = tk.Tk()
app.title(APPNAME)
window = MainWindow(app)
app.protocol("WM_DELETE_WINDOW", window.quit)
app.resizable(width=False, height=False)
app.mainloop()
```

Tkinter doesn't really have an application object, instead it provides an invisible top-level window which we use as the parent of a real visible window. If the user clicks the application window's X close button the `MainWindow`'s `quit()` method will be called. Since we always show a fixed block of 512 bytes we've made the window non-resizable.

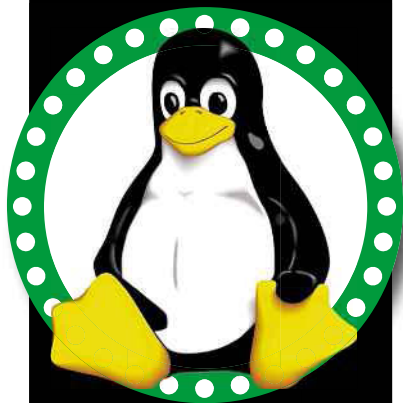
Calling `mainloop()` starts the GUI event loop and the method doesn't return until the application is terminated.

There are many improvements that could be made. One would be to colour alternate rows with different backgrounds such as white and a very light colour, to make them easier to see. Another would be to add a vertical scrollbar with the same range as the offset spinbox and synchronized using the same `self.offset` `tk.IntVar`. (In this case we'd probably be best off setting the offset spinbox's to value to the full size of the file.)

There are many Python GUI libraries available. Tkinter is small, fast, and comes with Python – and is excellent for creating tiny applications like Hex View. For more substantial applications, especially those requiring sophisticated custom widgets, I recommend using PySide (which is what I use), PyQt, or wxPython instead. [mm](#)







David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

# Linux

# Happy birthday, Linux!

## Twenty five years, and more love from MS

**T**he last week of August marks the 25th year that we've had Linux as an alternative operating system. Yes, it's now been a quarter of a century since Linus Torvalds built an OS and posted his work on a forum, and there's been a lot of movement in the Linux since then. Who could have imagined that his simple command-line operated branch from Unix would one day become a thorn in Microsoft's

terms with the fact that Linux doesn't need a 'year', it just needs to continue evolving.

There's a lot Linux can offer the user. From just your basic day-to-day computing, through to more specific work, including video and photo editing, scientific work, development and so on. In recent years the OS is being trained more and more into a gaming environment, thanks to Steam and developers taking more of an interest.

gaming? Whatever you think, I'm sure you'll join us in hoping it's around for another 25 years.

## Power-Linux-Shell

Bash for Windows 10 has generated a lot of press in recent months. The ultimate merger between the two platforms almost seemed like fantasy, until the recent Anniversary Update for Windows. However, August 18th saw the release of PowerShell open source, available for both Mac and Linux machines. This follows the Bash for Windows and SQL for Linux, so PowerShell for Linux is the next step for a world of multi-platform, multi-cloud and multi-OS 'oneness'. PowerShell is still in the Alpha build, but available on GitHub, with builds available for Ubuntu, CentOS and Max OS X 10.11.

Could this mean a Winux operating system, where you can run both Linux packages and Windows executables in the same environment without the need for a third-party API convertor or emulation? That would certainly be interesting.

▼ **Happy birthday, Linux. Here's to another 25 years!**

“ Linux doesn't need a 'year', it just needs to continue evolving ”

side, the world's most used server operating system, and the front-end to the most powerful supercomputers ever?

Think about it. Linux is behind the servers that run Facebook, Wikipedia and Twitter – in fact over 90% of the internet has a Linux server running it. Not bad for one person creating a Kernel as a hobby.

The 25th anniversary of Linux has also managed to dredge up the old 'Year of Linux' articles. Some of them from the past are quite amusing, as writers forecast the end of Microsoft within the year, and that everyone will be running Linux on their desktop. It's the same formula over the next ten years' worth of 'Year of Linux', and it isn't until more recently that people appeared to come to

So where next? In some ways, it's best that the OS just continues to grow on the desktop, offering the user a secure, stable environment in which to work and play. There's still a lot of potential left for the OS to take the lead from other systems, who knows, perhaps the future of Linux is with





# Back To The Mac

**As rumours of MacBook Pro updates continue to swirl, Craig Grannell wants more iPhone features welded to his Macs**

**M**ost innovation drives at Apple has been about making things more convenient and user-friendly for the people using its products. Apple rarely seems to care about specs – at least not publicly; bar some horsepower Photoshop shoot-outs back in the days, when the company would glue a Pentium chip to a snail in its ads, Apple's mostly concentrated on what you can actually do with your devices.

Of late, iOS has got the bulk of the love. In fact, at the time of writing, there's genuine concern about the lack of updates to the Mac line. There are worries pro machines might have been abandoned entirely, despite senior executives making loud noises about high-end Macs around the time the 'waste bin' Mac Pro made its debut. Even the bulk of Apple's top-selling notebook line is starting to look worryingly long in the tooth.

Whenever there's a reasonable gap between Apple product upgrades, the rumour mill kicks into gear – and now it's in overdrive. According to the grapevine, the MacBook Pro is going to get a fairly major revamp, which will incorporate several components you'd usually consider more suited to an iPhone. There will reportedly be a touch-input LED strip above the keys, with context-sensitive virtual buttons that change depending on the app you're in and the task you want to perform.

Suggestions are also that this Mac will get TouchID, giving you the means to unlock your computer using a thumb, along

with securing apps containing private data, and helping you more efficiently make payments online. There are even whispers Apple might bundle 3G/4G connectivity with a Mac for the first time, enabling a MacBook Pro to connect to the internet without you having to lug around a separate cellular unit to plug into your notebook. And toaster-fridge fans are crossing their fingers that Apple will cave in and make its notebook displays touchscreens.

Apple has a tendency to be cautious, though, and very infrequently makes huge shifts in hardware. It's anyone's guess where we are in that particular cycle right now. Some of the rumours also come across as fanciful, not least the notion of a touchscreen MacBook (given that macOS isn't optimised for touch interaction). et plenty of people would be happy to see key hardware innovations on iOS make their way to the Mac sooner rather than later.

Touch ID, in particular, is one of those features you perhaps thought would be throwaway, but is so natural that you miss it when it's not there. I've sat

dumbly with my finger on an iPad Air's Home button before realising that, no, that model pre-dates the feature. On a Mac, it would be great to use a digit to unlock apps and pay for things, rather than laboriously typing in passwords (or having to rely on password managers, which – showing no sense of irony – often require you enter a complex password in order to gain access).

With rumours Apple's about to ditch the headphone port on the iPhone in favour of Lightning, getting a Lightning connector on notebooks would be welcome, too. After all, if you're going to buy a new pair of half-decent headphones for your iPhone, you'll also want to use them elsewhere. Still, given that Lightning is a sort-of USB equivalent on iPhone, that Apple now owns a headphones company, and that Apple execs probably don't care much about people who buy lovely headphones and actually want to use them with their iPhone *and* Mac, this is probably the most fanciful wish-list item of all. We should all just cross our fingers for Touch ID, then.

▼ *Imagine one of these, with a context-sensitive LED strip, 3G/4G connectivity, Touch ID, a touchscreen, and a Lightning port. Now pick two... Tops*



**Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find Craig on Twitter at @craiggrannell**

# Mac



Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

# Mobile

## End Of Summer Gaming Special

**Ian McGurren rounds up some mobile fun for the start of the autumn**

**T**raditionally the change in seasons from summer to autumn means that, while things cool down outside, in the tech world it begins to hot up with a slew of software and hardware releases as well as the high-point in the gaming release schedule. However, with so many games coming out, it's really easy to miss some good ones. So, without further fluff, here are some of the best on Android and iOS.

### Reigns

Let's start with a unique title from London-based dev Nerial. It's been described as Tinder meets turn-based strategy meets card games – and, to be fair, that's a pretty succinct description. Hear us out...

You're a king who has the tribulations of the role given to you in the form of cards, which you swipe left or right depending on your decision. Being a king, your lot isn't a simple one so, for example, you can opt to employ a witch that may strike fear in your enemies, but could also put you in poor standing with the church. The game is presented in a unique style along with a gorgeous soundtrack from the excellent Disasterpeace (Fez). Best of all, there are no IAPs, and it's a pretty fair £2.29 to buy.

### Legend Of The Skyfish

iOS has previously played host to a very well received *Zelda*-like in the form of the gorgeous *Oceanhorn*. Now, there's another, and where *Oceanhorn* paid homage to *The Wind Waker*'s gorgeous cel-shaded look, *Legend Of The Skyfish* is

builds on the look of the SNES classic, *A Link To The Past*, replacing pixels with hand drawn art. The gameplay, however, is in a similar vein, with the action viewed from overhead.

There's not just action, though, there's also a healthy dose of puzzles and bosses too. Like *Reigns* it's also thankfully bereft of any IAPs and isn't bad value at all for £3

### Riptide GP Renegade

Like *Legend Of The Skyfish* has its roots in a Nintendo classic, so does the *Riptide* series, with its gameplay hailing from the N64 classic racer *Wave Race*. This third title in the series keeps the same core jet ski racing gameplay, but ramps up the fun factor by way of introducing dynamic and varied courses instead of the previous standard racing courses. If you remember the Dreamcast game *Trickstyle* then you'll be in familiar territory. Graphically, it's a game designed for more powerful hardware so expect lots of pretty touches for your £2.29.

### Deus Ex Go

Following on from *Hitman* and *Lara Croft*, *Deus Ex Go* is another in the excellent 'Go' series, where AAA titles are boiled down to clever turn-based puzzle gameplay, while still maintaining the core draw of the title it represents. So where with *Lara Croft* the emphasis was on treasure and with *Hitman* it was with stealthy deaths, *Deus Ex Go* incorporates the likes of augmentation, hacking, and well... stealthy deaths too – all to uncover the conspiracy-led plot

over 50 levels. There's also extra puzzles every (weekday), so for £4, there's plenty to do.

### Six!

Finally, another of those simple-yet-infuriating puzzle games (see also *Stack*) that you just can't stop playing. *Six!* is a mash-up of *Tetris*, Jenga, and a balancing act. The name comes from the Hexagon perched atop your stack of blocks, held together in a *Tetris*-like fashion. The idea is you get points from removing the blocks by tapping, all the while balancing the hexagon on the top. It's easy to learn, but hard to master. There is an IAP, but just to remove the adverts, and it's only £3.

Mobile gaming is going from strength to strength. With the likes of *Pokemon Go*, it's literally going places console's really can't. As the gap between the power of consoles and mobiles shrinks with each generation, it's a great time to be playing handheld games.



# No Route Back For Me

**Andrew Unsworth says the portable router is a fantastic device**

It might not be very flashy or grand, but I'm a portable router evangelist. I have been since getting my mitts on a decent one years ago; I think they're brilliant, and a handy device to have about your person or home. It's also something that I'm keen to tell other people about. Don't get me wrong, I don't stare, transfixed, at the manufacturers' websites waiting for the next portable router to be released – all while imagining just how much better life would be with a new portable router that accepts a 64GB MicroSD card rather than a measly 32GB card – I'm just as interested in the latest Tesla vehicle, VR headset or games consoles as anyone else. However, I do value technology that facilitates the fun stuff, another example being a NAS drive. Not enough people know how much easier their lives would be with this kind of tech, and that's a shame.

It's possible to use modern smartphones as a mobile hotspot, and this is something I've done in the past, when I've wanted to stream a film on my iPad, or continue working when a landline broadband connection has been lost, but I much prefer to use an item that's designed for the purpose. I can load a data SIM into a portable router and top it up when I need it. My wife can then take it about with her when she needs data on the go (she frequently runs out of her allotted data each month), and the battery of my router lasts a long time, so I don't have to reach for the charger that often.

Having something that allows access to the internet for multiple people is a great convenience, too – especially if you're travelling by car or have a car that can make use of a mobile hotspot. Alternatively, you may want to use your own private internet connection instead of the free, public hotspot made available in pubs, cafes, and hotels.

If you'd like to purchase one, there are quite a few from which to choose. Some can be purchased from mobile internet providers such as Three or O2 as part of a contract package with a monthly data allowance included, or can be purchased on a pay-as-you-go basis. These devices are likely to be locked to specific providers, so you might not be able to use another SIM card in them. It's best to check with the provider before purchase, or buy a device that is specifically SIM-free so that you can use a data SIM from whichever data provider you want.

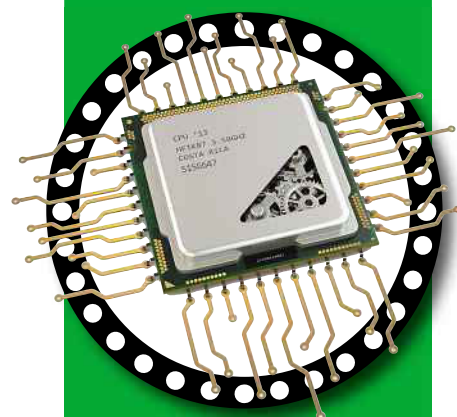
Major and respected brands that produce portable routers include TP-Link, Huawei, and Netgear. The model I use is no longer available, but it's a 3G

device, so I've been considering an upgrade to a 4G model. Then again, it isn't broke and my connection is quick enough to download whatever I want quickly, or stream video to my TV or iPad.

Three ([tinyurl.com/jcgusao](http://tinyurl.com/jcgusao)) and O2 ([tinyurl.com/z9jq5eg](http://tinyurl.com/z9jq5eg)) have a selection of Huawei devices for sale, and it's possible to get a contract deal from either for a modest amount each month, or buy the device outright. In the case of Three's Huawei E5573, you can buy the device with 12GB of data (that's valid for a year) for £80, which is tempting.

One router that has caught my eye is the Netgear AirCard 810 ([tinyurl.com/zrhjfsf](http://tinyurl.com/zrhjfsf)), mostly because it has a 2.4" colour touchscreen. However, it also allows the use of a 2.4GHz or 5GHz networks, allows up to 15 devices to connect to it and also has a battery that lasts up to 11 hours between charges. Nice.

If you find yourself wishing that you could use your router while on the move, consider investing in a portable one.



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

# Hardware







Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

# Gaming



## Fangs For The Memory

*First, do no harm: doctor-turned vampire Jonathan Reid faces an uncomfortable dilemma. Does he heal the sick, or eat them for dinner? Awkward*

This week, Ryan checks out the forthcoming vampire game from the makers of *Life Is Strange*, and checks out *Halo 5*'s creation tools as they make their PC debut...

### Plug & Play

It can't be easy being a vampire. You have to avoid sunlight, your fangs keep clanging against the side of the mug when you attempt to drink coffee, and you can't eat garlic bread. Spare a thought for Jonathan Reid, then, who not only has to deal with all those challenges but also has his own guilt to contend with. Formerly a doctor before he got turned into a shadow-dwelling bloodsucker, Reid's more used to saving lives than taking them – and now he has his unquenchable thirst for the red stuff to contend with.

This is the scenario for *Vampyr*, the forthcoming action RPG from French developer Dontnod Entertainment. The studio won deserved acclaim for last year's *Life Is Strange*, a thoroughly original graphic adventure series which took in teenage angst, school bullies, murder and supernatural powers. After the assured storytelling of that game, maybe we can be excused a sneaking bit of disappointment when we laid eyes on the first alpha footage for *Vampyr* – and discovered a game that looks like a bit like *Dishonored* with elements of the later *Deus Ex* entries thrown in for good measure.

Not that *Vampyr* doesn't look solid from a technical standpoint. Set in 1918 London, a city gripped by an infamously murderous bout of Spanish Flu, *Vampyr* conjures up a suitably bleak gothic atmosphere, as Reid plods through benighted streets of cobblestones and gaslights. That he occasionally stoops down to pick up the odd scrap of metal or discarded box suggests we're in for a bit of crafting; the occasional fight with anonymous-looking shadowy figures hints at some fairly standard action scenes involving blunt instruments.

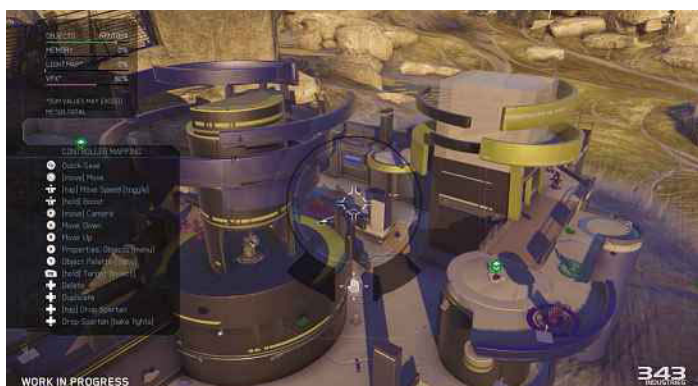
Where *Vampyr* really gets interesting, though, is in its exploration of Reid's struggle with his growing bloodlust. As he wanders around the city, Reid can chat to the flat-capped residents using a branching dialogue system which recalls the canned response options of *Mass Effect*. The twist is that the player has to decide who – if anyone – Reid will kill in order to feed. Dontnod has said in interviews that you don't necessarily have to kill anyone to get to the end of the game, though Reid will inevitably get thirsty at some point – particularly if he's injured in combat, and needs blood to replenish his energy.

Because Reid's also a doctor, he can heal as well as kill – and because of the flu epidemic, there are plenty of patients to help out around the city. Acting as a doctor will bring its own benefits, as grateful humans will divulge helpful information after they're nursed back to health. Not that all mortals appreciate Reid's presence; word is, there are vampire hunters lurking in London – and, unlike its regular citizens, they're capable of sniffing out Reid's true nature.

So while it's true that certain elements of *Vampyr* look a tad generic, the tension between the human and undead sides of Reid's nature that could separate the game from the action RPG crowd. Does Reid hew to his Hippocratic oath as a doctor, or submit to the blood drinker within? We'll know more when *Vampyr*'s released in 2017, but it's pretty clear that being a vampire sucks.

### Online

*Halo* has had a bit of an odd relationship with the PC since its inception in 2001. While the first two games eventually came to Windows, those that followed have largely been exclusive to the various flavours of Xbox. Microsoft has put out over the years.



▲ No, we don't get to play Halo 5 on PC, but at least Microsoft is giving us Forge – a free creation suite that lets us make our own 16-player shooter maps

While console owners were enjoying Halo 4 and 5, PC users had to make do with the top-down spin-off shooters *Spartan Assault* and *Spartan Strike*. In 2015, Microsoft made the curious move of launching *Halo Online*, a free-to-play incarnation of the series, which was effectively an online version of the ageing *Halo 3* engine. Even stranger was that *Halo Online* was only launched in Russia, and barely lasted more than a few months. After a bout of closed beta testing, developer Innova Systems announced that the game was "temporarily suspended".

It's now clear that *Halo Online* has been quietly put out of its mystery as a member of its developer calling himself Fogeyma reports that "the game in its current form will not be released." In its place, we at least have *Halo 5: Forge*, the creation suite element of *Halo 5*, which Xbox owners have been tinkering with for about seven months.

Launched on the 8th September, *Forge* is a free download – albeit exclusively Windows 10 – allowing users to

create and share their own maps and host 16-player matches. The PC edition adds a few creature comforts to the Xbox version, such as keyboard and mouse support alongside 4K monitor options. Maps will be cross-platform, too, with no partition between PC and Xbox creations.

What PC users won't get, though, is *Halo 5* itself; anyone hoping that the launch of *Forge* might also prompt Microsoft to make the game available for Windows 10 will be disappointed. *Forge* also appears to lack the matchmaking support of its Xbox equivalent, too, though there will apparently be a separate app that – Microsoft says – will make finding games easier for PC users.

PC gamers are a cunning bunch, though, and it's likely we'll see *Forge* used to create the kind of bizarre modes and experiences that Microsoft didn't intend. YouTube's already studded with videos of quirky *Forge* creations, including sci-fi themed versions of dodgeball and sumo wrestling. We're looking forward to seeing what madness arises as the PC edition rolls out.

## Incoming

Internet dwellers may not be responding to this year's *Call Of Duty: Infinite Warfare* in quite the way Activision would have liked – its trailer's one of the most disliked YouTube videos in history for some reason – but there's always the lure of its perennially popular zombies mode to get players back onside. Called *Zombies in Spaceland*, the mode has an 80s theme that's about as subtle as a sledgehammer – neon lights,

arcade machines, gaudy clothes and even a spot of undead breakdancing. The multiplayer zombie slaughter takes place at a funfair, and weapons range from the usual automatic weapons to *Ghostbusters*-like laser guns to exploding ghetto blasters. It looks like solid, splashy fun, and should mark a welcome change of pace from the more grim-faced sci-fi action of *Infinite Warfare* itself.

*Call Of Duty: Infinite Warfare* is out on the 4th November. [mm](#)



▲ *Zombies in the decade that taste forgot.* *Call Of Duty: Infinite Warfare's* zombie mode takes place in an 80s funfair, and features the voice talents of one David Hasselhoff...



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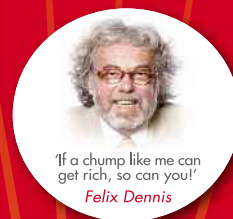
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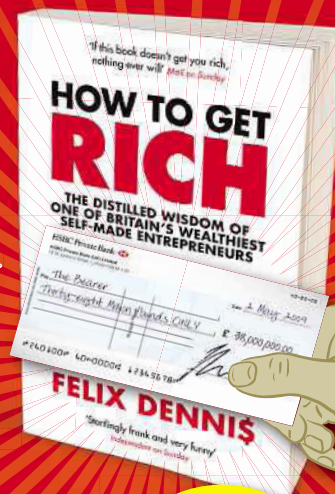
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Email: [pcmadnessltd@yahoo.co.uk](mailto:pcmadnessltd@yahoo.co.uk)

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SIMM DIMM DDR DDR2 DDR3 call or email me requirements

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Intel 32bit CPU 512MB Ram 3x pci 2xSATA 2IDE LAN, sound good for gaming, office work, surfing, movies. Generally a good all round system specm can be changed if required please email or call me for prices.

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**Motherboard Bundle 2.4Ghz**

AMD Athlon XP 32bit CPU 512MB Ram 5xpci 2IDE LAN sound good for gaming, office work, surfing the net, watching movies generally a good all round system spec can slightly be changed if required please email or call me for a price

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**Fans different sizes and types**

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Email: [pcmadnessltd@yahoo.co.uk](mailto:pcmadnessltd@yahoo.co.uk)

**NVIDIA AGP 128MB Graphics Video Card;** model number P162 £3 plus postage. (untested)

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**LAN network cards.** Various PCI and ISA types wired and wireless all tested and working please let me know what you are looking for I will try and match up as close as possible please email or call me for a price  
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## HARDWARE WANTED

**Trying to breathe life back into an old machine? Why not submit a wanted ad to this section of the classifieds. You never know on of the computer enthusiasts who read the magazine could have exactly what you're looking for. What's more, it won't cost you a single, solitary penny!**

**WANTED: Tape drive backup.** Either DAT320 or later generation LTO system in good condition. Please contact me.  
*Tel: (07949) 407022 Email: tape.20.odaily@spamgourmet.com*

**WANTED:** You bought a Corsair water cooler, with a square block. You fitted it to your Intel processor. You want to make a few pounds from the spare A.M.D. bits? Contact me!  
*Email: johnrpeel@gmail.com*

**WANTED:** Gigabyte GA-Z77X-D3H motherboard wanted.  
*Email: johnbeiry@gmail.com*

**WANTED:** PC Tower case (beige colour if possible) to rehome an Amiga A1200 vintage computer. The Amiga motherboard is H 410mm x L 190mm (H 16" x L 7.5"). PSU not an issue but if available 250 watt more than enough.  
*Tel: Bill (07742) 061569 or (02641) 769503.*

## SOFTWARE FOR SALE

**Adobe Photoshop Elements and Premiere Elements 12 Full Version - Windows/Mac.** Original Boxed CD with unused product key. £47.50  
*Tel: Ian (01932) 856971*  
*Email: a2345@btinternet.com*

**PCB design software.** 127 layers, schematic entry, PCB entry, PCB to Gerber file converter, output to printer. £9.99  
*Tel: Nigel Wright (07967) 527693*  
*Email: cresswellavenue@talktalk.net*

**Microsoft Office 2013.** Original Software only £100.  
*Tel: Gordon (01314) 660205*  
*E-mail: scobie09@gmail.com*

**Cyberlink PowerDVD 12** Standard. Runs under Windows 8, 7, Vista or XP. Original CD with unused product key £7.50  
*Tel: Ian (01932) 856971*  
*Email: a2345@btinternet.com*

**Nuance Omnipage 18.** OCR; Windows 8, 7, Vista or XP, Original CD with unused product key £25.  
*Tel: Ian (01932) 856971*  
*Email: a2345@btinternet.com*

**Acronis True Image Home 2012.** Bootable CD. Application runs under Windows 8, 7, Vista or XP. Original Acronis CD with unused product key £5.  
*Tel: Ian (01932) 856971*  
*Email: a2345@btinternet.com*

## SOFTWARE WANTED

**Good Text to Speech program** WinXP or 7 to read ebooks aloud for a pensioner with few resources. *Tel: Wilf James (01767) 699809*

**Wanted: PictureToExe** software, for making picture shows.  
*Tel: (01202) 610602*  
*Email: ivor.mary@talktalk.net*

**Wanted: Quicken 2001.** I desperately require a copy of QUICKEN 2001, UK Edition. I need to reinstall the program, but have lost my original installation CD.  
*Email: david.maddams@icloud.com*

## IMPORTANT BUYING ADVICE

**We work very hard to police our classified ads, and make them as secure as possible. However, please do your bit too and use the following guidelines:**

- **Never - NEVER** - pay by bank transfer or post out cash, unless you know the trader already, or are sure it is okay to do so. Pay by cheque, Paypal, Nochex etc wherever possible.

- Be wary of anyone who insists on you paying by the above methods if in doubt, get us to check them out by mailing [editorial@micromart.co.uk](mailto:editorial@micromart.co.uk)

- Keep copies of all correspondence

- When sending out goods, at the least obtain a certificate of posting from the Post Office

**If you are in any doubt, feel free to send us a mail via [editorial@micromart.co.uk](mailto:editorial@micromart.co.uk).**

**Every year, thousands of successful transactions take place through our classifieds, and that's just how we like it.**

**Help us help you keep them one of the safest and most secure places to buy and sell computer kit.**

To place an ad, simply fill in the form on page 99 and mail it in, or email the details to:  
**[MicroMartClassifiedAdverts@gmail.com](mailto:MicroMartClassifiedAdverts@gmail.com)**

# ASK AARON



**Meet Aaron Birch. He's here to help you with any general upgrading, software and system building problems. He's got advice aplenty and you're very much welcome to it!**

Send your questions to:  
Aaron Birch  
Micro Mart  
Dennis Publishing  
30 Cleveland Street  
London  
W1T 4JD

Contact Aaron by email at:  
aaron@micromart.co.uk

Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

*Aaron*

## Off To Uni-server-sity

For years I have been collecting computer wallpapers and often wondered and tried to discover where to start to set up my own server hosting them. There are so many 'set up your own web server sites', but I have no idea where to start. I have worked in IT for 27 years, so you would think I should know.

It's obvious that I need to decide whether I want to pay for a hosted server service, or do I want to set-up local server at home connected to the Internet.

Is there a site or book that you recommend I use to start such a Wallpaper server service?

**Mike**

*It's difficult to recommend any specific sites or books, as there are simply so many. I would, however, advise you not to begin with your own server at home. This would be harder to organise, and you'd need to consider security, your own bandwidth, and all of the other elements anyone hosting a server needs to take into account.*

*A better option may be to use an online service to begin with. There are plenty of them around, with many offering reasonable prices [see our Web Hosting feature on p36, for a start - John]. These services take care of all the setup, security, maintenance, and have dedicated support. It takes a lot of the effort out of your hands, leaving you to deal with your actual site.*

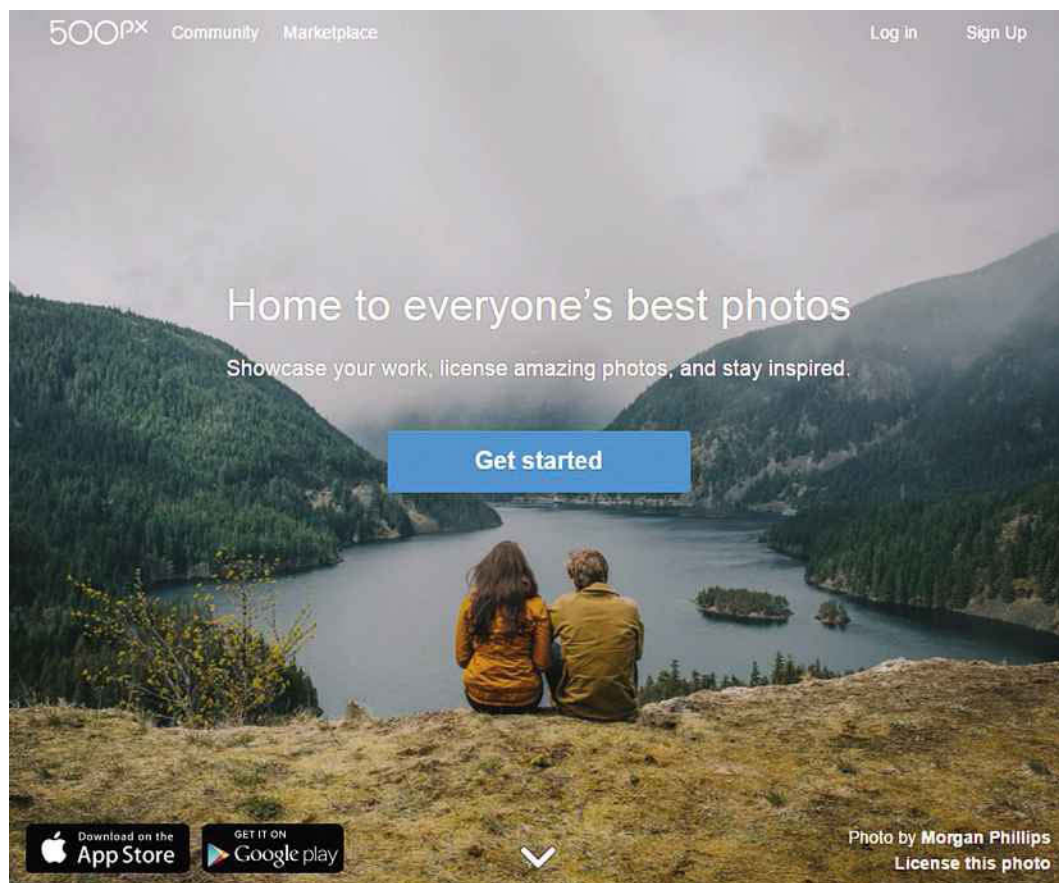
Another option you may want to consider would be to utilise a specialised image hosting and sharing service. Sites like Flickr, Imagur, Smugmug, and even Google+ all allow users to upload and share images with others.

Often they're tools used by professionals like artists and photographers who need a digital portfolio, so they should suit your needs too, without the outlay and costs associated with hosting services.

A particularly good site is 500px ([500px.com](http://500px.com)). Unlike many other sites, this is aimed squarely at the artist and user who wants to share their work with other like-minded people. It's geared towards being able to share, and even sell your work, and also has a mobile app to support it. Although it's not necessarily designed for the distribution of wallpapers, many people have used it for this purpose, and some users place their photos and works on there, with others grabbing these and adapting them for use as wallpapers on their PCs.

One thing you need to consider is the legality of sharing the wallpapers if they've been created by others. Distributing copyrighted materials can be troublesome, and can open you up to all sorts of legal issues. This can be especially problematic if you decide to sell anything, so be sure you're able to distribute content if you can.

▼ **500px is a service for sharing photos and other artwork, and can be useful for other purposes too**



## Failed Updates

I'm still running Windows 7 and have been struggling for a few weeks now to get it to install the latest Windows update version (not Windows 8 or anything, just the normal updates). When I try to update it, every time it just fails, and I'm stuck with an older version, and don't have the latest security patches. This worries me.

I really don't want to upgrade Windows to 8 or 10, as I find Windows 7 has everything I need, and I also don't want the extra cost. I'd really like to be able to update my copy of Windows 7, but if needs be, I'd rather run it without the latest updates than move to another OS. I'd also like to avoid having to do a reinstall if at all possible. Any help you can provide would be great. Thanks in advance.

**Neville**

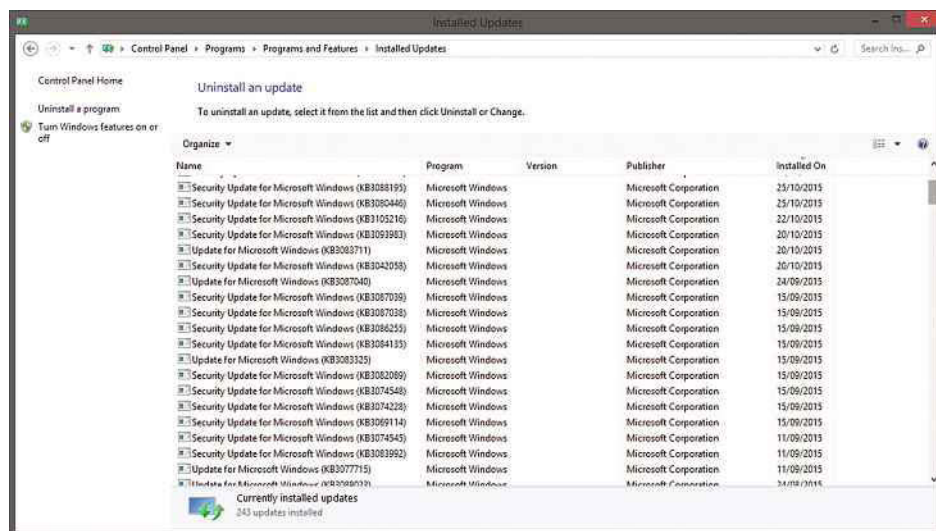
*When you get issues with Windows updates not working, it can be tricky as there are many things that could have gone wrong. A common fix would be to uninstall older updates and then try to re-download, as some older updates may contribute to your issue. It's difficult to say how far you should go back, and which updates you need to remove, but if you can remember*

*when the last update worked, you can simply roll back to that. You can do this via Add/Remove programs, where you can click the option to view Windows updates. These should be listed in date order, so it may just be as simple as removing the latest updates and trying again.*

*Another option, and one that a lot of users have found success with, is to manually update Internet Explorer. You can do this via Windows Update (by choosing your updates*

*yourself, and installing them one at a time). This may also be a good option, as you could install the updates one-by-one to see which is failing. Once you know which is causing problems, you can investigate the issue in more detail as you'll have a good place to start. If the update isn't critical, you could even skip it, and just update what you need.*

▼ **If Windows Update is causing problems, you can manually take over and install the updates you want**



## Laptop Down?

My Acer laptop has recently stopped working, and won't boot up at all. When I press the power, nothing happens. No fans, no lights, nothing. I thought the battery may be dead, so I plugged it into the mains, and nothing happened either. The power brick lit up as normal, but nothing happened to the actual laptop.

As it stands, all it is at the moment is a door stop, and I really could do with using it, or at least getting the data off it and onto my desktop PC, which works fine.

Is there anything you can suggest?

*It would appear as though the issue you have is, indeed, likely with the laptop battery, but not simply because of a lack of charge. You could also have a larger problem, but let's look at the battery first.*

*As nothing happens when you plug the unit into the mains, I'd focus on the battery initially. Try to remove and reseal it, just in case there's a loose connection. If this doesn't fix the problem, there's a highly probable chance the battery is faulty. However, as you said no lights come on, and nothing happens at all, I'm more concerned with the laptop itself. Laptops will usually work when plugged into the mains, even when the battery is removed, so you should be able to use the laptop regardless of the state of the battery, as long as it's plugged into the mains. The fact you can't do this could suggest a more serious issue.*

*To test this, I'd suggest you remove the battery and try running the laptop off the mains. If the laptop runs, you may still have a battery issue, but there could be some problem causing the laptop to be unable*

*to switch to mains power when the battery is installed. Again, this could be a battery issue, but it could also be a loose or faulty connection on the laptop side too. If the laptop doesn't power up without the battery in, and should, you're looking at a possible faulty laptop, and it would need more hands-on investigation. If your warranty is still active, you're golden. If not, you may have to take it to a repair shop.*

*Regardless of the state of the laptop, as long as there's no issue with it, you should be able to remove the hard drive from the unit and plug it into your desktop PC. This can then be used as another drive, and you'll be able to retrieve your data.*

**Col** ▼ **Laptop batteries can fail, giving the impression there's a problem with the laptop**





# ASK JASON



**Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs**

Send your questions to:  
Jason D'Allison  
Micro Mart  
Dennis Publishing  
30 Cleveland Street  
London  
W1T 4JD

Contact Jason by email at:  
jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

*Jason*

## Scan Fan

I travel a lot with my work, and occasionally it would be useful to be able to scan order forms with my Android phone and have them converted into editable text. I know this is easily done on the desktop, with a flatbed scanner. A colleague mentioned Abbyy's FineScanner, but I've soon found that getting this to do anything useful costs a fortune. Are there any cheaper apps? I don't mind paying, but I don't want to single-handedly pay the developer's salary!

**Bernard, Gmail**

*Most mobile scanning tools leave me scratching my head. All they seem to do is take a photo and let you crop it, rotate it, and change the contrast. What am I missing here? Why wouldn't you just use your camera app? In my view, such tools only have value when they offer OCR – optical character recognition. This is what you're after, Bernard.*

*As you've found, the leading app appears to be Abbyy's FineScanner. Abbyy's a big name on the desktop, too.*

*From what I can see, the app costs £4.19 per month – but that doesn't get you the OCR functionality. That's an extra £23 (a one-off payment). If you want to lose the adverts, that's another £5.49 (again, a one-off payment). I \*think\* that's how it works, anyway – the app is far from clear.*

*However it works, though, those prices, in this day and age, are frankly absurd.*

*Take your hat off, then, to a little company by the name of Microsoft. I'd recommend you search Google Play for Office Lens. Grab it – it's gratis. It'll turn photos of text into editable Word documents. It works pretty well, too, though it won't recognise handwriting (Microsoft claims it does, but I've had zero success – which may actually say more about my handwriting than it does about the app). If you need that function, try Stoik's Mobile Doc Scanner 3 + OCR. This costs £4.59, which I think is fair enough. Download Mobile Doc Scanner 3 Lite first, though. It's free, so you can see if you like the way the app operates. You can upgrade to the OCR version from that.*

*Note – Office Lens is available on Android, iOS, and Windows Phone/Mobile, but you'll need a Microsoft account (free) and some OneDrive storage (also free). FineScanner is only available on Android and iOS, however. Mobile Doc Scanner 3 is on Android only. BlackBerry 10 users are pretty much out of luck, which sadly is nothing new.*

▼ **Free Android OCR from Microsoft? Who'd've thunk it!**



## Bits And PCs

**This week I have been mostly...**

...reading that 68 million Dropbox passwords were leaked in 2012 (I think, at this point, we have to accept that nothing online can ever be truly safe)

...playing *Jurassic Park Arcade* on my hols in Weston-super-Mare (it's a new game, not the one from years ago – it's like *House Of The Dead* and absolutely dinotastic)

...watching the battery indicator on my ageing laptop tick down before my eyes (I'm writing this column whilst sipping Devil's Backbone in a seaview 'Spoons)

...listening to the same people every night by Marine Lake saying such things as 'Ooh, there's an Eevee' and 'Wow – I've just caught a Wartortle' (I only know this, of course, because I've been down there with them)

...breaking go-karts on the Grand Pier (yep, I went full-tilt into some poor lad's kart (he'd spun off and was hidden on a corner) and my own kart stopped dead and wouldn't budge – oops!)

► **Probably the most fun you can have with a £1 coin**



## Shed Games

I've got some hard drives in a box in the shed. They've got old photos on and stuff. This is what counts as my backup system! The subject came up with a friend in the pub and he reckoned that the cold had probably killed the drives stone dead. Is there any truth to that? Surely hard drives are used every day in far colder conditions than my shed! Should I take any precautions before firing them up?

**J. Rose, West Midlands**

A typical hard drive is safe to be stored between about  $-40^{\circ}\text{C}$  and  $70^{\circ}\text{C}$ . That's the so-called non-operating range. No natural environment on earth gets hotter than  $70^{\circ}\text{C}$  (according to Wikipedia, the world record is  $56.7^{\circ}\text{C}$ , in Death Valley), though some places can get colder than  $-40^{\circ}\text{C}$ .\* I'm guessing your shed isn't one of them.

Your drives should be fine. Where you need to be careful, however, is when moving them into the house.† They'll have to acclimatise. Most drives have a bleed hole in the top – usually labelled with 'Do not cover' – and this lets air in or out to allow air pressure and humidity to equalise (helium-filled drives are completely sealed, though). The danger when going from cold to warm is condensation, and if any gets into a hard drive it's pretty much game over. Leave your drives for twenty-four hours before plugging in the juice.

\* The safe \*operating\* range is typically about  $5^{\circ}\text{C}$ – $55^{\circ}\text{C}$ . On a job I had years ago, I got caught out this way one winter when firing up a PC every morning in my office/unheated shipping container.

† The Hard Drive that Came in from the Cold – Richard Burton's finest hour (actually 112 minutes).

▼ Can hard drives in storage for archive or backup purposes become damaged if they get too cold?



## Take It To The Bank

I'm a bit confused about power banks. I think one would be useful for when I'm out and about, but I'm not sure. Most units boast how many times a given phone's battery can be recharged, but really I'd want to use mine as a backup power source when my phone's battery gets weak. I'd want it to behave as though I'd taken the drained battery out and slotted in a charged one (though the battery's sealed inside on my phone). Can power banks be used this way?

**Jagdeep, Gmail**

Yes, they can. Think of a power bank as a mains charger that just happens to be portable. It'll charge your phone when the phone's off and the battery's maybe dead, but it'll also keep the phone going when the battery's about to conk out. Normally, a power bank will be able to charge at the same time as the phone's being used – the same as a mains charger normally would – but this does depend on what you're doing. Pokémon Go, for instance, is such a heavy-hitter that I've seen a battery drain even as it's on charge – both with a power bank and a mains charger. That's no good



▲ Power to the people...

at all when a Blastoise has just popped up in the wild. Believe me, I know.

Many power banks support some form of quick-charging, which at the basic level means an output of 2A or 2.1A. Treat this as a minimum requirement, Jagdeep, as it should eliminate the problem above and should also get your battery charged to 50% or more in 30 minutes or less. Many mains chargers only output at 1A; some cheap ones are rated at just 500mA. More expensive power banks often charge at 9V and 12V as well as the standard 5V, which

again can improve charge speed, though of course even the best power banks in the world can only deliver the amperage (A) and voltage (V) supported by the phone.



▲ ...and not just those in Tooting



# Crowdfunding Corner

This week's Crowdfunding Corner returns to some tried-and-tested product categories: GPS trackers and headphones. How are these ones better than the alternatives, though?

## Trak Taag Tracker

A built-in GPS tracker could help you keep track of your smartphone, but what about things that don't have GPS? The Trak Taag allows you to add GPS functionality to almost anything – from your keys, to your car, to your kids. However, unlike other trackers, it has a long-life battery that we're told can last for 80 years of recharges – so it's safe to say you'll not need to buy an awful lot of replacements.

The Trak Taag isn't unique – GPS trackers turn up on Kickstarter quite a lot – but it does have a huge number of features. It flashes and beeps when separated from its paired phone/tablet, two-way alerts allow you to play a noise on either your phone or the tag, the GPS locator shows its last position on a map, and there's even a programmable remote button so that you can use it as a wireless trigger.

You can get a Trak Taag for just \$19 (£14.50), shipping in January 2017. You have a choice of four colours (pink, black, electric blue or royal blue) and the package also includes a charge cable. If you want two, you can get them for just \$14 (£10.50) each. The relatively low target of \$4,800 has been more than doubled at time of writing, so it's full steam ahead on this one!

**URL:** [kck.st/2bBGWo0](http://kck.st/2bBGWo0)

**Funding Ends:** September 15th, 2016

## FIL Diva Pro Headphones

Headphones are also common on Kickstarter, but again, these ones pack in features like nobody's business. These wireless on-ear headphones are not only beautifully designed, but support voice search, touch control and active noise cancelling, come with 4GB of internal storage for music, and offer hi-fi quality sound.

The storage and playback support lossless formats like FLAC, WAV and APE in addition to standard MP3 and MP4 files. The touch-sensitive controls allow you to skip tracks and adjust the volume just by swiping, and you can engage the voice functions by saying "hello FIL" and control hands-free.

If you're quick, you should be able to pick a pair headphones up for the early bird price of \$129 (£98), but full price for Kickstarter backers is still fairly cheap at just \$149 (£113) and a guaranteed minimum of 25% off the eventual retail price. Units are almost ready to ship (they should be sent out as early as November this year), so if you're looking for some new headphones it's a comparatively short wait! It's worth noting that the project doesn't even end until October. It has a \$50,000 goal to hit, however – but based on current performance it'll have no problem getting that. Still, it's never too early to get on board a project if you really like the look of it.

**URL:** [kck.st/2bBu2Uw](http://kck.st/2bBu2Uw)

**Funding Ends:** October 4th, 2016



## Trak Taag

4 bright colors available



*Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!*



# App Of The Week

## Prisma

### We apply some cloud-based artistry to our selfies

There's no shortage of photo filtering apps available on the main mobile platforms, however the one that currently has everyone changing their Facebook profile pictures is a newcomer named Prisma.

It is a little different to a lot of the other photo enhancing apps. For one, it's remarkably tiny – around 15MB. There's no account needed to set it up and start using it, and it does most of the hard work in the cloud as opposed to on the device itself.

#### Mobile Van Gogh

The key feature here is that the Russian development team, Prisma Labs, has created an artificial intelligence routine that goes into making up the Prisma styles. It uses a selection of learning algorithms to alter a selected image depending on what the user chooses. It'll warp straight lines, add pencil like drawings and shadings to certain areas, as well as boost the colour and contrast in other areas. The overall end effect can be quite stunning, and even the most unphotogenic *Micro Mart* writer can end up looking quite good.

There are currently 35 different photo filters to choose from, with each adding a little postmodern artistry to the picture you've taken. Mind you, it isn't just selfies that can benefit from Prisma's AI tinkering. You can alter any images taken from your device's camera into the styles available, and make them a little more personal, or artistic, without ever having to learn how to employ masks or fiddle with a virtual pencil.

#### Create And Share

Once you've altered your image, you can choose to share it to a number of social media portals, or use the built-in sharing functions your device offers. If you don't want to share it that way, you could opt to download the image, and post it to wherever you'd normally visit yourself.

There were a couple of issues, though. The first was the connection to the cloud – where all the artwork is shuffled and compiled to emerge as the artistic end result. More often than not, the Prisma cloud servers were extremely overloaded, which ended up with either a lost connection, or the picture not being filtered correctly.

#### Features At A Glance

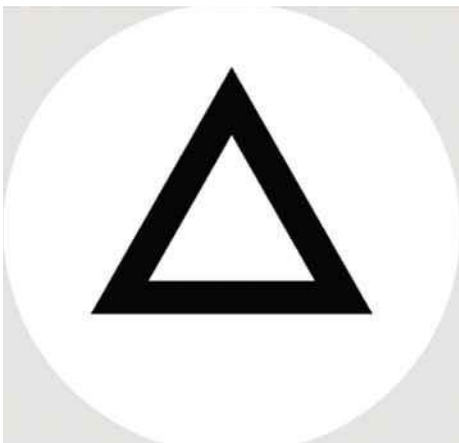
- Free
- Modern Art filters
- Easy sharing
- Over thirty different filters available

The other issue we had was the inability of the app to use the rear camera on our device. This could be just an issue on the phones and tablets we were testing it with, but for some reason whenever we tried to change the camera, it refused to connect. This left us trying to take a picture of one of the *Micro Mart* cats with the front camera, not an easy task with an animal that refuses to sit still and be photographed.

#### Conclusion

Prisma is a fun app to play around with. You can get some impressive looking photo effects with very little work, and there's likely to be more filters available as time goes on.

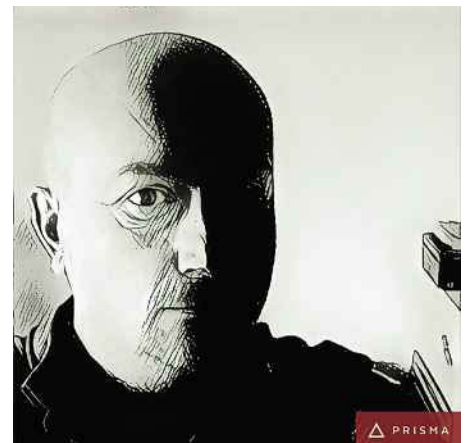
If you fancy a new Twitter or Facebook profile image, then download Prisma and get snapping away. [mm](#)



▲ Prisma, the current favourite for anyone in need of a new Facebook profile pic



▲ The *Micro Mart* cat isn't an easy target to get a picture of



▲ Even *Micro Mart* writers look better after the Prisma treatment

# Logging Off

**T**he anniversary update to Windows 10 was important for both the Microsofts and customers. For me, it was critical in providing a means to exit their horrible Insider programme, which over the past year has driven me utterly bonkers. On paper it seemed like a great idea: new versions of the OS and apps coming to you on almost a daily basis, or slightly slower depending what 'ring' you're on. It sort of works on Android, so surely that would be great on Windows too?

No. Those machines I enrolled in the insider programme rarely worked as needed; bludgeoned with seemingly untried code, and failing to run basic applications smoothly and without exception errors.

The argument, and I've seen it presented elegantly on a number of websites, is that 'the cutting edge is often where you bleed'. The upside of this thrill-seeking being that you get to play with features and apps before anyone else. So, is it only me who now accepts that being an unpaid beta tester isn't as fun or glamorous as it once was? Maybe it never was, and I'm just slow on the uptake? Looking through the features Microsoft kept adding – like ridiculous efforts to enhance the experience for the five people who own a Surface Pro 4 and use the pen – it seems ludicrous that I ever thought it worth making the Edge browser almost unusable, knacker almost every webcam connected to a PC, and allowing Team Redmond to generally muck about with things that weren't broken (but are now) while ignoring those bits that patently never worked as intended.

The final straw for me was when, each time a new release came along, it began putting back all the moronic universal apps that I'd previously deleted, insisted on adding back the US keyboard, and then made it my default choice just for good measure. Indeed, there are numerous other defaults that it entirely ignores and overwrites – so many, in fact, that I've not the room to mention them all here. Therefore I now prefer that Windows 10 upgrade as little as is humanly possible, because every time it does it involves time and effort to put it back how I'd like it – and usually another upgrade to fix whatever it was they broke the previous time. This is true even on those releases that aren't Insider builds, disturbingly.

This isn't the experience I wanted, and I can't really believe that it was what Microsoft intended, even if that's exactly how it panned out.

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In the meantime, I've had so many issues with my work PC that I've just rolled it back to Windows 7 just before the 30-day deadline expires. Some of those problems, not all, would probably been solved by scrapping the PC down to bare metal and reinstalling but, frankly, I've just not got the time to indulge Microsoft's quaint development cycle.

Being entirely serious: it's depressing that that's where we are. After using computers for approaching 40 years I'd like them to just work, and not exhibit the sort of petulance I'd associate with getting a 1904 Darracq from London to Brighton. Even enthusiasts have little interest in spending any their lives attempting to track down the source of numerous avoidable errors. Microsoft badly needs to wake up that, and stop selling tickets to their great development adventure.

*Mark Pickavance*

## LAST WEEK'S CROSSWORD

**Across:** 7 Alexander Bain, 8 Webcam, 9 Squawk, 10 Install, 12 Decoy, 14 Jumbo, 16 Burette, 19 Greece, 20 Thumbs, 22 Insignificant.

**Down:** 1 Blue, 2 Exocet, 3 Anomaly, 4 Mensa, 5 Obtuse, 6 Viewport, 11 Neutrino, 13 Justify, 15 Brexit, 17 Equeco, 18 Feint, 21 BenQ.

### DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. As the boss (aka Anthony) is away for a week, and the initial joyful freewheel of production descends into the desperation of a Friday afternoon press deadline, it falls on us to impart to you the state of Micro Mart... In short, we're knackered and a bit sad; the summer is visibly drawing to a close, football's back on the telly - and crashing even further into the cricket season than ever before - the kids are back at school

(we can hear them screaming and swearing like an office party on Christmas Eve in the playground across the road from our office window) and we have to face up to the reality that Autumn will soon fall upon our sleepy, slowly balding pates (Sarah, Caroline, and the boss-man excepted, they're not balding nearly as badly). With our current state of collective exhaustion in mind, it's beginning to feel like the right kind of time for us to start gathering nuts and preparing for a hibernation - which, in technology terms, is exactly what John appears to be doing with the rather large collection of Raspberry Pi, Pi Zeroes, and accessories gathering around his desk. Deadlines being what they are, though, the poor chap keeps getting a rap on the knuckles when he tries to fiddle with them, though. Time and deadlines wait for no man.

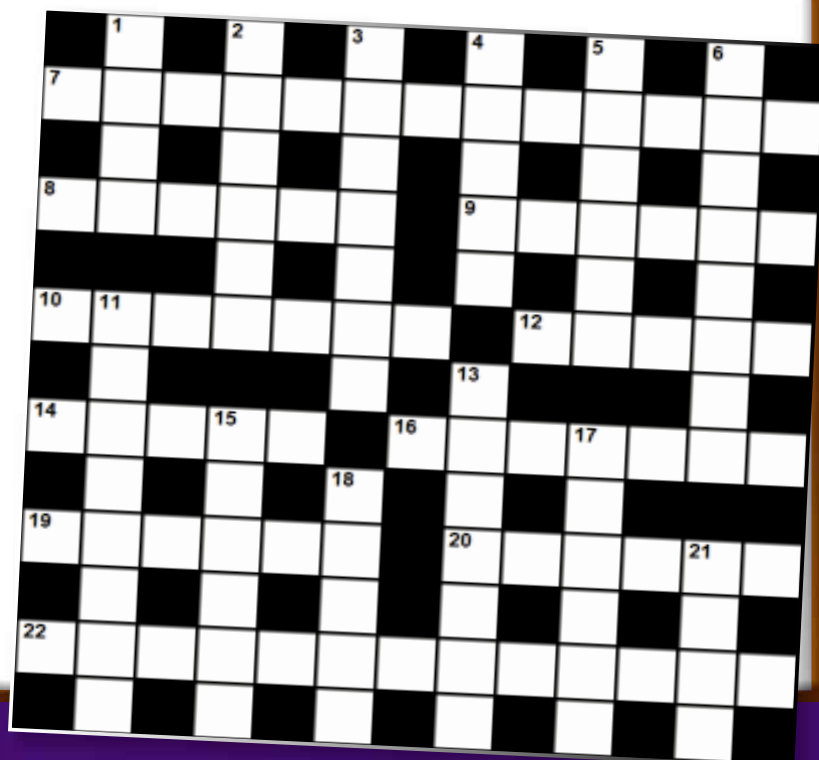
## THIS WEEK'S CROSSWORD

### Across

- 7 A value or quantity that is nearly but not exactly correct. (13)  
8 Heat metal and allow it to cool slowly, in order to remove internal stresses and toughen it for use. (6)  
9 A shaped sheet or ring of material sealing the junction between two surfaces in a device. (6)  
10 A tube or trough for protecting electric wiring. (7)  
12 Occurring or observed frequently or in accordance with regular practice or procedure. (5)  
14 Long range hyperbolic global navigation system finally phased out in March 2001. (5)  
16 Porky pie? (7)  
19 A feature that is linked to many parts of a computer program, but which is not necessarily the primary function of the program. (6)  
20 A loose page or section in a magazine or other publication, typically one carrying an advertisement. (6)  
22 People that collect picture cards, postcards or cigarette cards as a hobby. (13)

### Down

- 1 Ctrl + O (4)  
2 A contact on a social network. (6)  
3 Software designed to take advantage of a flaw in a computer system or programme. (7)  
4 A family of personal computers marketed by Commodore in the 1980s and 1990s. (5)  
5 Inactivity resulting from a static balance between opposing forces. (6)  
6 Showing willingness to allow the existence of opinions or behaviour that one does not necessarily agree with. (8)  
11 The facility on some computer screens or televisions to adjust the picture size so that the picture is bigger, but the edges of the picture are lost. (8)  
13 Slow down or prevent a process or chemical reaction, (7)  
15 A chain reaction sandbox video game developed by EA Bright Light for Windows, PlayStation 3, Wii, Xbox 360 and Mac OS X : It was released in 2010. (6)  
17 .ru TLD (6)  
18 A protocol for secure communication over a computer network which is widely used on the Internet. (5)  
21 The relative speed of progress or change. (4)





# Top 5

## Ways Technology Has Made The World More Stupid

Is your brain getting the love it needs?

### 1 No Memory

Surely the greatest thing about the internet, other than email and all the abundance of cat pictures, is the sheer amount of information you can find. In a way, you have access to the world's biggest library, a source of seemingly infinite amounts of information.

Indeed, accessing the web has become so quick and convenient these days that you rarely actually need to remember anything. You can spend hours reading about history or science, completely forget it all, and then just look it up again later when you want to satisfy your curiosity about something.

When did this all happen? We're not sure, but we're 100% certain we could come up with an answer if you gave us five minutes and access to a smartphone.

### 2 Bad Writing

Like we said, the web provides a vast amount of easily accessed information. Unfortunately, a lot of it is written by uninformed, untrained and sometimes barely literate amateurs. On one hand, the web is great because it's given everyone a voice. On the other hand, it's awful, because it's given everyone a voice.

Yes, the fact that normal people can express themselves in words, and even build a following of readers, is fantastic. However, if the only thing people ever read is badly written blogs, and they don't know any better, then they're not going to learn much, other than how to write badly written blogs.

### 3 Short Articles

There is, of course, some fantastic writing on the web, both from established publishers and bloggers, but the majority of it is short-form writing. One major reason for this is that it's just not particularly comfortable to read long articles on a backlit screen, which includes PC monitors, smartphones, and tablets. The act of scrolling also isn't as convenient either.

On top of that, if you can get a page visit with a 250-word article, why bother to publish a 2,000-word piece instead? You make the same amount of advertising money either way. The only way to make more is to split the article over several pages, irritating your readers in the process.

Ultimately, reading long articles on the web still feels like a chore. And as good as short-form journalism can be, you just don't get the same depth of thought as you would with a long-form alternative.

### 4 GPS Dependency

The satnav is a truly wonderful thing, doing away with inconvenient paper maps and making it far easier to find our way around. If you use it all the time, though, you might you never actually remember any routes at all.

Indeed, studies have suggested that over-reliance on this technology could actually have a negative impact on brain function as we age – particularly in the hippocampus, which is involved in memory and navigation processes ([goo.gl/u1TB7S](http://goo.gl/u1TB7S)) – but if you need any more proof that relying on GPS is dangerous, just check out this collection of satnav disasters: [goo.gl/3Xkb0](http://goo.gl/3Xkb0).

### 5 PewDiePie

Is PewDiePie, aka Felix Arvid Ulf Kjellberg, making people more stupid, or is he just a reflection of rising levels of overall stupidity? Probably a bit of both. The fact that a grown man screaming and doing silly voices while playing videogames has become the most popular thing on YouTube is probably a good sign that civilisation is falling headfirst into a pit of irrevocable idiocy. The more popular he becomes, the more others want to copy him, and the more his brand of energetic inanity infects the world.

Clearly, though, Mr Pie is doing something right, because he's made millions – not only from YouTube, but also from games based on him. We won't be buying them anytime soon, but fair play to him, we guess.

If you are going to watch his videos, however, you should probably read a book or something afterwards, just to counteract all the stupid you've ingested. [mm](#)



▲ I don't care what the satnav says. This is not the Costa Brava!

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